U.S. Army Corps of Engineers

Risk and Reliability of Infrastructure Asset Management Workshop

Hosted by:
Technical Directors Office
Coastal and Hydraulics Laboratory
U.S. Army Engineer Research and Development Center

15-18 August 2006 - Alexandria, VAUSACE Asset Management Risk and Reliability Workshop
15-18 August 2006

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Table of Contents

Executive Summary.....3

Agenda.....7

Process Report.....11

Appendices

A Workshop Handbook.....15

B Attendee List.....23

C Flood and Coastal Breakout Session Notes.....25

D Deep Draft Breakout Session Notes.....34

E Inland Navigation Breakout Session Notes.....48

F Hydropower Breakout Session Notes.....56

G Daily Notes – from the Flip Charts.....65

Executive Summary

Background

A workshop was held August 15-18 in Alexandria, Virginia to begin the dialog on the methodologies available and the status of how the US Army Corps of Engineers assesses its Civil Works infrastructure and applies risk and reliability in the management of that infrastructure. The workshop was organized by the US Army Engineer Research and Development Center (ERDC) in collaboration with Headquarters, USACE and in support of the initiatives on asset management. Over 75 people attended representing 6 of 8 Corps divisions, many districts, HQ, ERDC, Institute for Water Resources and academia. The group included a diverse representation of planners, economists, engineers, operators, researchers and managers.

The reliability of many USACE structures has been reduced and the risk of failure has been increased due to age and insufficient funds for proper maintenance and rehabilitation. A sustainable infrastructure plan based on intelligent asset management, is the fundamental principal of both the USACE Campaign Goal 3C and the Presidents' initiative through Executive Order 13327, Federal Real Property Asset Management. Implementation of a robust plan is the best way to prioritize needed infrastructure improvements with limited funds. A critical component in establishment of an asset portfolio and an adaptive management strategy is the knowledge of an assets' condition, its' functional reliability, and the risks and consequences of poor performance or failure.

A plan for Intelligent Asset Management does not exist for the entire portfolio of Corps assets at this time due to lack of assembled information, standardized assessment practices, and integrated policies for addressing information about structures' condition, functional reliability and the risks and consequences of failure.

Workshop Purpose

The workshop objectives were centered around the current condition assessment methodologies and risk and reliability (R&R) tools available for the complex mix of USACE assets focusing on a subset of the Corps business lines, Navigation, Flood and Storm Damage Protection, and Hydropower. It was recognized that the entire portfolio of assets were not represented and would be the topic of future discussions. Status of existing R&R tools and recommended needs for future development were presented and documented. Potential policy issues were identified.

Objectives of the workshop were:

- Standardize terminology and understanding related to condition assessment and risk and reliability.
- Discuss current and future challenges related to portfolio assessment and risk management;

- Provide a forum for sharing lessons learned, partnering, and collaboration;
- Evaluate applicability of existing tools and data requirements for different business lines; and
- Identify technical gaps and corresponding R&D requirements across business lines.

One objective of the workshop was to share best practices across business lines, identify commonalities, and look for opportunities for future sharing of these techniques. A full day and a half was devoted to informing participants of current practices through presentations and raising issues important to each business line in a plenary format to establish a common base of understanding and finding common ground for the work ahead.

Break out sessions focused on prioritizing the issues surfaced during the plenary sessions within each business line and "data mining" the tools, data gaps, research needs, and opportunities for collaboration that exist both for Condition Assessment and Risk and Reliability incorporating condition assessment. The workshop attendees were separated into four groups according to business line areas: deep draft navigation, inland navigation, hydropower, and flood and coastal storm damage reduction. Detailed results of the workshop and break out sessions can be found at http://chl.erdc.usace.army.mil/rriam-presentations

On the final day there was one final breakout session where each group was asked to provide one goal and one action item. These were presented back to the entire group and included in a plenary summary where information from previous sessions was synthesized and consolidated to develop high priority issues and to begin formulating a strategy for moving forward. Assignments were made in each group and an upcoming meeting was identified to share their action item with their community of practice. Each group will report to their business line leaders at HQ and back to the Workshop coordinators by October 31, 2006.

Workshop Takeouts

The following represents the some of the recommendations or takeouts from the workshop captured during the discussions:

Program Integration

- What is question(s) we are trying to answer? From Operators? Users? Managers? Decision Makers? OMB? Congress?
- Needs strategic vision
- Develop integrated framework for Asset Management with direction from Senior leadership
- Create portfolios for each class of asset (to include important non-Corps owned assets)
- Prioritize funds for completing each portfolio assessment
- Integrate programs and tools

- May NOT have one common Condition assessment across business lines or class of assets
- Tie smart tools into budget development
- Centralize AM activities
- Process mapping critical in assessments
- Must have standardized inspection and assessment processes and centrally trained cadres

IT systems integration

- IT systems rules/guidelines should be centralized
- IT/IM requirements complex and costly
- Integrate IT systems
- FEM integrates across business lines but for facilities and equipment only
- Centralized data: One-time data entry must be a rule

Communications

- Need AM Gateway
- Must have common terminology- develop dictionary of terms
- Centers of Expertise must integrate across business lines, not be 'stove-piped'; this should include all the 'centers' within the corps
- Make best use of centers of expertise
- Introduce AM to CoPs
- Communication systems can solve many integration problems
- Next workshops need to include stakeholders and more operators

Workshop Conclusions

The presentations and the discussions pointed out that 1) condition assessment and risk and reliability analysis can vary from the simple to the complex and is not a "one-size-fits-all" process; 2) different business lines and certain classes of assets have more complete assessment methodologies in place than others, but in general the Corps does not have a national picture of the condition of its assets; 3) the Corps must complete assessments across its portfolio of major assets before risk management can be used in decision making.

Effective risk management will require as first steps an inventory of each class of assets, some form of standardized condition assessment, and a method to evaluate the reliability of these assets and consequences of unsatisfactory performance. But to effectively balance tradeoffs and integrate mission objectives through a risk management approach will require some common objectives or metrics and an integrated framework. During the workshop, a recurring discussion came back to the connection between Corps' mission and value to the nation, and the need to establish minimal expectations and acceptable thresholds of risk. From the workshop, expectations regardless of business line or mission fell in to the following categories of national value:

- Economic

- Environment
- Life safety
- Security
- Societal

Establishing common metrics for these categories and establishment of minimal expectations for categories of assets and acceptable thresholds of risk will help to maximize outputs. A common set of expectations would help decision makers manage risk within and across business lines.

A Corps' Asset Management Center of Expertise/Program must coordinate and integrate all stovepipes and business line activities with focus on assets and:

- their condition,
- the acceptable reliability (tolerable risk),
- the value of the assets,
- their role in supporting the mission performance,
- clear metrics to support performance based budget process

It will be important that this program has buy-in from the Administration and Congress and that the program provides a credible method to request funds and assure the assets provide value to the nation and stakeholders.

As stewards to the nations' largest portfolio of water resources infrastructure, the Corps' needs consistent and robust methods for assessing the condition of these assets and a risk management strategy that minimizes risk and optimizes reliability within budget constraints. The Risk and Reliability Workshop provided an important opportunity to take a holistic look at the status of our ability to quantify the condition of the water resources infrastructure. Next steps for success will be establishment of a more permanent asset management program, development of an integrated framework for risk management, and establishing a consistent and robust strategy for condition assessment across the entire portfolio of Corps assets.

USACE Asset Management Risk and Reliability Workshop
Tuesday – Friday (15 – 18) August 2006

15 AUGUST 2006 (DAY 1) Tuesday

8:00 – 8:30 Welcome, Introductions, Logistics, Purpose of the Workshop, (**Soileau**)
8:30 – 8:40 Charge from Headquarters (**Barnes**)

Plenary Session 1: USACE Business Line Asset Management

8:40 – 8:45 Introduction to Plenary Session 1 (**Soileau**)
8:45 – 9:15 Asset Management Definitions Primer (**Hale**)
9:15 – 9:45 Condition Index Definitions Primer (**Estes**)
9:45 – 10:15 Risk Definitions Primer (**Bridges**)

10:15 – 10:35 Break

10:35 – 11:05 Reliability Analysis Procedures for Infrastructure Facilities (**Nowak**)
11:05 – 11:45 Asset Management Initiations, Directions, and Status (**Knight**)
11:45 – 12:05 Questions and Discussion

12:05 – 1:15 Lunch

1:15 – 1:20 Introduction to Business Line Leaders Round Table Discussion (**Soileau**)
1:20 – 1:25 Navigation (**Premo**)
1:25 – 1:30 Flood and Coastal (**Chapman**)
1:30 – 1:35 Hydropower (**Sadiki**)
1:35 – 1:40 Recreation (**Jackson**)
1:40 – 2:25 Business Line Leaders Round Table Discussion of Issues

2:25 – 2:45 Break

2:45 – 3:15 Data Requirements for Asset Management (**Krahenbuhl**/**Foltz**)
3:15 – 3:45 Overview of Condition Index (**Foltz**)
3:45 – 4:15 Overview of Engineering Risk and Reliability (**Schaaf**)
4:15 – 4:45 Incorporating Risk and Reliability into Decision Making (**Moser**)
4:45 – 5:15 BPA – Using Condition Index (HydroAMP) for Economic Decisions (**Rux**)
5:15 – 5:30 Summary of Plenary Session 1: Definitions and Issues (**Soileau**)

16 AUGUST 2006 (DAY 2) Wednesday

08:00 – 08:05 Logistics (Soileau)

Plenary Session 2: Condition Assessment, and Risk and Reliability Examples from Business Lines (Topics of Interest)

8:05 – 8:10 Introduction to Plenary Session 2 (**Soileau**)
8:10 – 8:35 Dam Safety PRA (**Halpin**)
8:35 – 9:00 Levees (**Halpin**)
9:00 – 9:25 Navigation LRD 5-year Plan (**Harder**)
9:25 – 9:50 HydroAMP (**Rux**)

9:50 – 10:20 Break

10:20 – 10:45 RecBest (**Jackson**)
10:45 – 11:10 Embankment and Spillway Relative Risk Assessment Procedures (**Chouinard**)
11:10 – 11:35 Using CI Ratings as an Estimate of Failure Probability (**Estes**)
11:35 – 12:00 Builder, Paver, Roofer, Railer (**Marrano**)
12:00 – 12:15 Summary of Plenary Session 2: Definitions and Issues (**Soileau**)

12:15 – 1:30 Lunch

Breakout Session 1: Condition Assessment by Business Line

1:30 – 2:00 Description of Workgroup Process and Tasks (**Soileau**)

2:00 – 3:30 Separate breakout sessions (break when appropriate)
1. Navigation (Deep Draft) (**Briggs**)
   (incorporating Environment (**Bridges et al.**))
2. Navigation (Shallow Draft) (**Winkler**)
   (incorporating Environment (**Bridges et al.**))
3. Flood and Coastal (**Curtis**)
   (incorporating Environment (**Bridges et al.**))
4. Recreation (**Jackson**)
   (incorporating Environment (**Bridges et al.**))
5. Hydropower (**Rux**)
   (incorporating Environment (**Bridges et al.**))

3:30 – 4:30 Plenary on Workgroup Results (**Soileau**)

4:30 – 5:00 Facilitators and Recorders meet with Soileau – Compiling group report Information, Recommendations, and Lessons Learned

17 AUGUST 2006 (DAY 3) Thursday

8:00 – 8:05 Logistics (**Soileau**)

Plenary Session 3: Risk and Reliability Examples from Business Lines (One R&R model from each Business Line)

8:05 – 8:10 Introduction to Plenary Session 3 (**Soileau**)
8:10 – 8:40 Ohio River Lock Reliability (**Schaaf**)
8:40 – 9:10 Levee Reliability (**Halpin**)
9:10 – 9:40 Dam Reliability (**Halpin**)
9:40 – 10:10 Beach Fill Modeling Reliability (**Gravens**)

10:10 – 10:30 Break

10:30 – 11:00 Coastal Structure Modeling Reliability (**Melby**)
11:00 – 11:30 Risk-based Deep-draft Channel Design (**Briggs**)
11:30 – 12:00 Summary of Plenary Session 3 (**Soileau**)

12:00 – 1:15 Lunch

Breakout Session 2: Risk and Reliability Tools by Business Line

1:15 – 1:25 Description of Workgroup Tasks (**Soileau**)

1:25 – 3:00 Separate breakout sessions (break as appropriate)

1. Navigation (Deep Draft) (**Briggs**)
   (incorporating Environment (**Bridges et al.**))
2. Navigation (Shallow Draft) (**Winkler**)
   (incorporating Environment (**Bridges et al.**))
3. Flood and Coastal (**Curtis**)
   (incorporating Environment (**Bridges et al.**))
4. Recreation (**Jackson**)
   (incorporating Environment (**Bridges et al.**))
5. Hydropower (**Rux**)
   (incorporating Environment (**Bridges et al.**))

3:00 – 4:00 Plenary on Workgroup Results (**Soileau**)

4:00 – 4:30 Plenary Synthesis (**Soileau w/others**)

4:30 – 5:00 Facilitators and Recorders meet with Soileau – Data Synthesis, Recommendations, and Lessons Learned

18 AUGUST 2006 (DAY 4) Friday

8:00 – 8:05 Logistics (**Soileau**)

Plenary Session 4: Working Groups ID How to Proceed

8:05 – 8:35 Issue Clarification
8:35 – 9:00 Prioritization
9:00 – 10:00 Goals
10:00 – 10:10 Prioritization

10:10 – 10:30 Break

Plenary Session 5: Summarizing Session (Soileau/Knight)

10:30 – 12:00 Summarize, recommendations, R&D needs, roadblocks
12:00 Conference adjourns

(Conference organizers and facilitators stay until 4:00 to finalize wrap-up elements.)

USACE Asset Management Risk and Reliability Workshop
15-18 August 2006
Alexandria, VA

Process Report

WORKSHOP DESIGN AND METHODOLOGY

Workshop Process Summary

Effective action is best built upon examination of available information but is very much dependent upon the actions of humans living and working with the assets and management area. The motivation for organizing and participating in this workshop came from fear of losses that failing infrastructure across the nation may precipitate, disasters such as seen in Katrina, as well as a hope for the implementation of effective asset management plans to prevent such losses in the future to the maximum extent possible.

At the beginning of each workshop, there is agreement among the participants on the problem statement being addressed and general desired outcomes such as: educated stakeholders (in this case themselves and through reach back the organizations they manage); and clearer and more in-depth identification of issues, goals, and actions to address the problem.

One crucial feature of workshops is that a lot of information can be gathered that has not been published. We estimate that 80% of the useful information that exists concerning a topic is in people's heads and likely never to be published. All participants are equal in the workshop process, recognizing the contributions of all people with a stake in the future of the management effort. Information contributed by technical people, planners, administrators, and academics all carry equal importance. To get the entire picture concerning an issue, all information that can possibly be gathered is discussed by the workshop participants with the aim of reaching agreement on the current information. These data are then put into the workshop report.

The value of the workshop process also lies in the communication that it facilitates. We often find that people may have been working with the same problems for years but have never sat down together to discuss the issues. Workshop participants work in small groups to discuss key issues, whether management, data collection, budgeting, communication or other topics that arise. Each working group produces a brief report on their topic which is included in the workshop document resulting from the meeting. Workshop reports and the recommendations that they contain are developed by and are the property of the participants.

First Day: Tuesday 15 August

The workshop opened with greetings and comments by Jim Clausner (Associate Technical Director for Navigation, Coastal and Hydraulics Laboratory (CHL), Engineering Research and Development Center (ERDC)). Rebecca Soileau (Lead facilitator, St. Paul District) then

provided an overview of the purpose and goals of the workshop and elements of the workshop design process. Sandra Knight (Technical Director for Navigation, CHL, ERDC, temporarily assigned to Headquarters (HQ) as Asset Management Team Leader) then introduced Jerry Barnes, Civil Works Operations Chief, who gave the group its charge from Headquarters.

One objective of the workshop was for all of the Business Lines to become familiar with the concepts of asset management, condition assessment, and risk and reliability, and the asset management practices of the other Business Lines. They were asked to fill in worksheets provided in the workshop handbook for each presentation and to realize opportunities for sharing techniques and discover needs that are common across the Corps. A full day and a half was devoted to informing each other of current practices through presentations and surfacing issues important to each Business Line in a plenary format in order to establish a common base of understanding and finding common ground for the work ahead.

Plenary Session I: Business Line Asset Management was the introduction to the fundamental concepts and briefing on previous work. Each speaker did a commendable job of covering the material and allowing time for questions and discussion. The questions and responsive discussion that followed each presentation throughout the workshop was captured on flip-charts by the lead facilitator and by Jim Clausner and Dinah McComas (Civil Engineering Technician, Technical Programs Office, CHL) for inclusion in the report. Several individuals requested this information so it was printed and handed out to the participants each day. The flip chart notes were used by the Business Line facilitators to identify issues that could be used as starter material in the breakout groups. These issues were also printed out and copies given to all breakout group members as working reference materials.

Plenary Session I continued after lunch with a Business Leaders Round Table Discussion. Each Business Line leader representative gave a 5 minute informal presentation on the top priority issues in that Business Line. This was followed by an opportunity for the Business Line leaders to ask each other questions. The floor was then opened to discussion. A flip chart was started to keep track of suggestions for “moving forward” from this meeting.

After break the Plenary Session I included presentations that covered the status of the asset management, condition indices, and risk and reliability.

Summary sessions of each of the workshops presentation plenaries allowed participants to give additional comments and discussion and to identify issues brought to light. The workshop day ended at 5:30. However, the facilitators and recorders all met for an hour and a half to review the next day’s breakout strategy and get some tips on their respective roles. Dinah McComas and Peggy Van Norman (Civil Engineering Technical, Navigation Branch, CHL) worked until 9:30 p.m. putting all flip chart data into computer files to be combined later with Jim Clausner’s notes, printing the files and making copies for the participants. Their dedication and hard work were a tremendous asset to the facilitators and were instrumental to the meeting breakouts being productive. Lynn Hales (Hydraulic Engineer, Technical Programs Office, CHL) and Jim Clausner contributed tirelessly as well, as recorders in the break outs.

Second Day: Wednesday 16 August

After logistics were covered, the second day got underway with Plenary Session 2: Condition Assessment, and Risk and Reliability examples from Business Lines (Topics of Interest). At lunch Dinah again made sure that all comments were printed and copied for the participants to use in the Breakout session to follow.

After lunch the lead facilitator introduced the tasks to be covered and tools to be used by the groups for producing a product and report in their breakout groups. This included a brief perspective on group dynamics and the "Groan Zone" they would inevitably work through. They were charged with summarizing the current status of their Business Line practices with respect to condition assessment and to perform a data assembly exercise on what is known and not known, in the same context.

The group then self selected areas to participate in of the 4 categories: Inland Navigation, Deep Draft Navigation, Hydropower, or Flood and Coastal and went to separate breakout rooms to begin work. A Recreation breakout group had been planned but was eliminated when only one representative came to the meeting and then was not able to stay for the break outs. The smallest group was Hydropower with 5 members. The largest was Flood and Coastal with around 15 members. The groups used flip charts to establish a group memory, a computer recorder, a timekeeper and the pre-selected facilitator. The lead facilitator floated between the groups and offered clarification and some process tips as needed.

The breakout groups each performed 6 tasks (see task sheet below) and gave reports back to the plenary. Each recorder and facilitator stayed for more than an hour after the close of the workshop to make sure all notes from the flip charts were included in the computer record, and to begin cleaning up the sentence structure and phrasing for clarification, endeavoring to stay true to the content of the discussion and not provide content editing outside of the group process.

Third Day: Thursday 17 August

Plenary Session 3: Risk and Reliability Examples from Business Lines (One R&R model from each Business Line). Presentations provided material and issues for discussion in the second breakout group session. Breakout Session 2: Risk and Reliability Tools by Business Line followed the format of the previous day's work with the exception that the groups were given the option of forming their summary status statement after the data assembly exercise as some of the participants suggested during the previous day's wrap up. The Hydropower group had a new facilitator as the previous day's facilitator was not able to attend. The workgroups reported back during a plenary session at the end of day, and the data compilation and cleanup by the facilitator and recorders was completed by 5:30 p.m.

Fourth Day: Friday 18 August

The final day the participants worked in their Business Line subgroups, choosing their highest priority issue after assuming that budgeting and guidance from headquarters on the framework needed for asset management were not in the scope of the discussion that day. During the plenary report back from the groups, individuals from each Business Line were tasked with specific action items and a timeline for reporting back to Sandra the outcome of their communicating the goal and suggested action steps to their Business Lines and Centers of Expertise. Sandra then led a brainstorming session to find common integrating themes of high priority to be considered in formulating a strategy for moving forward.

USACE Asset Management Risk and Reliability Workshop Handbook

15-18 August, 2006
Alexandria, VA

WORKING AGREEMENT

Workshop Facilitators: Rebecca Soileau
Michael Briggs
Bill Curtis
Lori Rux/ Charlie Krahenbuhl
Michael Winkler

Primary Roles

Lead Facilitator: Sets time and tasks
Facilitates plenary discussions
Maintains focus on overall workshop theme
Maintains the integrity of the workshop design

Participants: Manage their own working group discussions
Provide information and determine issues of concern
Create matrix of tools

Ground Rules

- Leave all personal and institutional agendas at the door to focus on the task at hand
- All ideas are valid
- Everything is recorded on flip charts
- Everyone participates; no one dominates
- Listen to each other
- Treat each other with respect ("Yes, and....)
- Seek common ground
- Differences and problems are acknowledged - not "worked"
- Observe time frames
- Complete draft report by end of meeting

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HUMAN FACTORS INFLUENCING OUR THINKING AND PROBLEM SOLVING PROCESS

- WE ALL HAVE BIASES AND ASSUMPTIONS
- UNCONSCIOUS ASSUMPTIONS AND THINKING
- WE SEEK PATTERNS IN EVENTS
- WE CHOOSE A PATTERN OR INTERPRETATION WITH LIMITED ANALYSIS
- WE SELECT DATA THAT SUPPORT OUR PREFERENCE
- WE IGNORE DATA THAT DISAGREE WITH OUR PREFERENCE
- WE START OUR ANALYSES WITH CONCLUSIONS – RATHER THAN DEFINING OUR PROBLEMS AND NEEDS
- IT IS DIFFICULT FOR PEOPLE TO MAKE OBJECTIVE ESTIMATES OF RISKS AND PROBABILITIES. WE IGNORE BASE RATES.
- DIFFICULT TO EVALUATE IN OUR HEADS ALL OF THE INTERACTIONS IN COMPLEX PROBLEMS SUCH AS NATIONAL SYSTEMS. THINKING TOOLS CAN HELP.

TO AVOID THESE TRAPS WE NEED TO STRUCTURE OUR ANALYSIS. Use thinking tools to assist in a systematic explicit objective process of problem definition, assumption identification, and seeking solutions. Groups of people are more productive of ideas and more inclusive of options than individuals working alone.

USACE Asset Management Risk and Reliability Workshop

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SELF-MANAGEMENT LEADERSHIP ROLES

Each small working group manages its own discussions, data gathering, time, and report production. Here are brief descriptions of the various roles to be played by different people in the group so that you can function as a group during the workshop. Leadership roles can be rotated; divide the work as you wish. **Remember, however, to assign these roles at the beginning of each working group session**.

Working group facilitator – Assures that each person wanting to speak is heard within the time available. Keeps the group task front and center at all times. Keeps track of discussion using flip charts. Records ideas using brief phrases to provide group memory and visible record of issues, ideas, and discussions. Checks with person that the phrase is an accurate representation of their contribution.

Computer Recorder – Keeps track of group discussion using a computer. This should not simply be a verbatim recording of the flip chart contents, but should also include a synthesis of the discussions accompanying the salient points written on the flip charts. It is important for this person to ask participants to briefly restate long ideas so that they can be accurately captured. This computer record will be the basis of the report from this workshop.

Timekeeper – Keeps the group aware of the time remaining for each working group session.

Reporter – Delivers the working group report in plenary. It is very important that this role be assigned at the beginning of each session so that the person can prepare a report accordingly.

Worksheet Purpose: To identify, in the context of your Business Line, New Tools, Gaps, Opportunities for Collaboration, and **Research Needs** that surface during the presentations.

Plenary Session 1: USACE Business Line Asset Management

Speaker name New Tools	Gaps	Collaboration	**Research Needs**
Speaker name New Tools	Gaps	Collaboration	**Research Needs**
Speaker name New Tools	Gaps	Collaboration	**Research Needs**

Breakout Session I : Condition Assessment by Business Line

Breakout Session II : Risk & Reliability by Business Line

Purpose: To develop a framework for action on how the Corps can more effectively implement Asset Management for the entire portfolio of Corps assets from each Business Line's perspective.

Tasks:

1. Determine the roles for your group.
2. Summarize (in a short paragraph) your Business Lines views on the current status of Condition Assessment Tools (10 minutes)
3. Reflecting on your Business Lines Asset Management processes in the context of the Condition Assessment, identify your group's key concerns regarding the process status and how it could evolve in the future. (20 minutes)
   a. Review the themes each individual identified during the program presentations and record these on a flip chart
   b. Brainstorm additional concerns; remember rules of brainstorming!
   c. Prioritize your group's concerns using (using sticky dots)
      - Each person receives 3 sticky dots.
      - Put a dot on the concern you feel *most needs to be addressed* (Note: you can put all your dots on one concern if you feel strongly about it or spread them among two or three issues.
      - Count and record the number of dots each concern received. The concern with the greatest number of dots is the top priority.
4. For each top priority concern, prepare a descriptive statement of why it is an issue of concern. (Power of 5 Whys)
5. Complete the Data Assembly for each top priority concern including known data and tools, data gaps, etc.

a. For each of the major priority issues you have defined, ask yourself the following questions:

- What are the facts that we and tools we use related to this issue?
- What important data/tools are missing that would better help us to address this issue (Gaps)?
- What existing tools from other Business Lines could be applied to our issues?
- What opportunities for collaboration would be immediately helpful?
- What are our assumptions surrounding this issue?
- How do we justify our assumptions?

b. Create lists of Knowns, Gaps, Other's Tools, Opportunities for Collaboration

c. Group the data within each list by importance if possible, using appropriate criteria. Priority can be given at a basic level (high /

medium/ low), without having to resort to more detailed means such as paired ranking.

6. Prepare a 10 minute presentation for plenary.

POWER OF 5 "WHYS"

The Refuge needs to educate developers around the Refuge.

Why **is this an issue?**

Because the developers are building homes around the Refuge...some right-up next to the Refuge boundary.

Why **is this an issue?**

Because many of the people in those homes have dogs and cats that are getting on to the Refuge.

Why **is this an issue?**

Because those dogs and cats are getting into duck nests and destroying the eggs.

The "real" issue: Waterfowl nest parasitism by dogs and cats.

USACE Asset Management
Risk & Reliability Workshop

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Task X: Actions

1. Develop a set of possible actions that will address the root cause of each priority concern. *What actions by the Corps would effectively improve Asset Management in the context of Condition Assessment and Risk and Reliability tools?*

Characteristics of an Action Step:
Specific - for each goal
Measurable - outcome or an indicator
Attainable – can be accomplished under current conditions
Relevant – helps solve the specific problem and needs to be done
Timely – can be undertaken in time to achieve the goal

Information to include in each Action Step

1. **Description** - a short statement which can be understood by a non-participant reader. Relate the action to achievement of a specific goal and solving the problem
2. **Benefits / Consequences** - if the Corps is able to implement the actions recommended, what does your group see as the possible benefits from implementing these in Asset Management processes?
3. What **obstacles / roadblocks** exist for implementing this action? For example: Specific conflicts in interests of stakeholders or regulatory requirements or lack of local support that may need to be resolved or specific lack of resources preventing accomplishment of the action.
4. Prepare a 10-minute presentation for plenary.

Attendees Risk and Reliability of Infrastructure Asset Management Workshop		
Aya-ay	Jonathan	LRH
Barker	Bruce	ERDC-ITL
Barnes	Gerald	HQ
Beasley	Dan	SAJ
Boc	Stanley	ERDC-CHL
Bridges	Todd	ERDC-EL
Briggs	Mike	ERDC-CHL
Brock	Ronn	SWD
Chapman	William	LRDOR
Chouinard	Luc	McGill University, Montreal
Chudgar	Anjana	HQ
Claseman	Kenneth	SAM
Clausner	Jim	ERDC-CHL
Cremeans	Rodney	LRH
Curtis	William	ERDC-CHL
Duett	Patti	ERDC-ITL
Deliman	Pat	ERDC-EL
Dunn	Christopher	HEC
Dunlap	Derrick	SPN
Ercums	Namejs	HQ
Estes	Allen	West Point, NY
Foltz	Stuart	ERDC-Illinois
Glenn	Rora	SAM
Gravens	Mark	ERDC-CHL
Hale	David	University of Alabama
Hales	Lynn	ERDC-CHL
Halpin	Eric	HQ
Hammond	Mark	LRH
Harper	Brian	IWR
Jackson	Scott	ERDC-EL
Jennings	Todd	LRH
Kidby	Michael	HQ
Knight	Sandra	ERDC-CHL
Krahenbuhl	Charles	NWW
Leitch	Robert	NWP
Lockwood	Richard	LRP
Mattis	Gerald	NWW

Attendees Risk and Reliability of Infrastructure Asset Management Workshop		
Marrano	Lance	ERDC-Illinois
McComas	Dinah	ERDC-CHL
McCormick	John	SAW
McKinley	Dennis	SAC
Melby	Jeff	ERDC-CHL
Moser	David	IWR
Nowak	Andy	University of Nebraska
O'Donoghue	William	LRE
Pankow	Virginia	IWR
Parez	John	ASA(CW)
Petrosino	Lawrence	NAD
Pope	Joan	HQ
Reilly	Barbara	POA
Riveros	Guillermo	ERDC-ITL
Rux	Lori	NWP
Sadiki	Kamau	HQ
Sapp	Shelton	SAD
Schaaf	David	LRL
Sharp	Michael	ERDC-GSL
Smith	Tim	LRH
Soileau	Rebecca	MVP
Stevenson	Charles	LRP
Syriopoulou	Dimitra	HQ
Theobald	Richard	LRB
VanNorman	Peggy	ERDC-CHL
Verna	Thomas	HQ
Weyer	David	HQ
Winkler	Michael	ERDC-CHL

USACE Asset Management Risk and Reliability Workshop
15-18 August 2006

Flood Control & Storm Damage Reduction (FCSDR) Business Line
Condition Assessment Breakout Session

Participants: Bruce Barker, ERDC-ITL; Pat Deliman, John McCormick, Mark Gravens, Eric Halpin, Lawrence Petrosino, Lance Marrano, Chris Dunn, Todd Jennings, Bill Chapman, Derrick Dunlap, Jonathan Aya-ay, Stuart Foltz, Luc Chouinard, David Hale
Facilitator: Bill Curtis, ERDC-CHL
Recorder: Dinah McComas, ERDC-CHL
Reporter: Todd Jennings, LRH

Current Status of FCSDR Project Condition Assessment

Condition Assessment (CA) is used widely, but inconsistently, within the FCSDR business line. In the absence of an overall framework, some organizations (MSCs, districts, and even sections) developed their own CA tools and strategies to suit their own purposes. This has led to wide disparities in the quality and usefulness of the different assessments, and it prevents these assessments from being used to make informed asset management decisions from a national (portfolio-wide) perspective. The conditions of some assets (such as beach nourishment projects) are not formally assessed at all. Coastal protection structures are assessed using a Condition Indexing (CI) system to prioritize maintenance, but this system can be subjective and is probably inconsistently applied across the nation. Maintenance of flood control dams at most districts is prioritized by condition assessment strategies developed by that district. The most rigorous, most consistently-applied FCSDR condition assessment tools are the Portfolio Risk Assessments (PRAs) being conducted to prioritize dam safety concerns at riverine flood control projects.

Key concerns

Workshop participants identified many concerns relating to condition assessments, which are listed in table 1 at the end of this section. The participants then narrowed the list to five key concerns using the "dot" voting method, with each participant allowed four votes. The key concerns, in priority order, were:

(**1) We need a consensus on the definition of CA**. What does CA mean in the context of the USACE asset management program? That will determine the structure, scope, and details of whatever CA program is finally implemented. Some components within a project will need to be assessed more frequently, or more thoroughly, than others, and some components may not even need to be assessed at all to support asset management.

(2) Update and define CA criteria. Fill in the gaps of our condition assessment program so that sufficient information is available to support rational asset management decisions.

(3) Need for multiple, systematic, and objective CA metrics. Different metrics will have to be

developed for different types of structures and/or components. These metrics must be designed to support the risk & reliability framework in which they will be used. And, since the actual assessments will be conducted by many different people, the metrics must be as objective as possible to ensure consistency across the entire portfolio.

(4) Need to establish a framework for integration of micro and macro views.

(5) Lack of consistently applied CA methods to rank projects within the F&CSDR program for budgetary purposes. Once systematic, objective metrics are developed, they should be deployed across the Corps of Engineers so that future budgets can target the most critical needs across the entire portfolio.

Order Listed	Concern	Votes Received
1	Maintenance requirements and triggers	0
2	Update & define CA criteria	11
3	Lack of public protection guidelines (i.e., how safe is safe?)	0
4	Lack of consistently applied CA methods to rank projects within the FDR program to for budgetary purpose	6
5	Lack of resources to conduct CA	3
6	Need for multiple, systematic and objective CA metrics	10
7	HQ viewed as obstacle w/r standardized CA	1
8	Need to separate CA from Risk and Reliability management	0
9	Stakeholder/Sponsor education w/r CA process	0
10	How do we consider the interaction of non-Federal & Federal assets (systems approach)	1
11	Need consensus on definition of CA	12
12	Need to establish framework for integration of micro & macro views	7
13	Undefined goal regarding corporate use of CA outcomes. I.e., why do we perform CA? (unranked – added to discussion following ranking)	N/A

Table 1 - Concerns identified in this breakout session

Issue Statement

Participants then used the key concerns to craft the following issue statement:

USACE needs to manage the FDR program to ensure public safety and wise investment in public infrastructure at the project or asset level through development and application of a consistently applied and clearly defined Condition Assessment Program (including guidance, criteria, and financial support) to ensure that projects perform as authorized and fulfill intended public purposes, and to facilitate budget prioritization within the F&CSDR program.

Data Assembly

Many condition assessment tools have been developed throughout USACE, some of which are

listed in the table at the end of this section. These tools have varying levels of data quality, and varying levels of usefulness for nationwide asset management. Few are applied consistently from one district to another. Most of the knowledge gained from these tools remains at the district level because, as mentioned above, there is no framework for sharing it or integrating it for portfolio-wide decision making.

Order listed	Condition Assessment Tool
1	Regularly scheduled inspections conducted at the district level such as PIs, stilling basin inspections, DOMP, equipment tests, etc. The frequencies for these different inspections range from weekly to once every five years.
2	FDA software for levee evaluation
3	O&M manuals
4	Maximo
5	Dynastar instrumentation
6	Photos
7	SPRA/PRA methods
8	Design memoranda
9	Physical surveys
10	GIS applications
11	Feedback from stakeholders / users
12	Condition Indexing tools such as those developed at ERDC for embankment dams, spillway gates, jetties & breakwaters, operating equipment, and concrete monoliths.

Table 2 – Available Condition Assessment Tools

Gaps hindering Condition Assessment

The main gaps which are hindering an effective condition assessment program, and which should be addressed, are the lack of: (1) An integrated decision making tool. (2) Data management and distribution tools. (3) Guidelines to prioritize public safety versus economics. (4) A framework for asset management and identification of how FDR projects fit within that framework (5) Lack of guidelines for how to perform condition assessments (6) Politics (7) Lack of consensus on how to perform condition assessments (8) Culture: it could be hard to get the necessary buy-in across the Corps for such a massive undertaking (9) Paucity of existing data

The two highest-ranking gaps (most critical needs) were the lack of guidelines, and the culture issue.

Opportunities for Collaboration

During a quick brainstorming session, the participants listed several possible sources of information about performing condition assessments including other USACE business lines (e.g., hydroAMP (process)), other governmental agencies (USBR, USDOT/Federal Highways, ANCOLD (Australia), the Netherlands, Canada)

USACE Asset Management Risk and Reliability Workshop
15-18 August, 2006

Flood Control & Storm Damage Reduction (FCSDR) Business Line
Risk & Reliability Breakout Session

Participants: Eric Halpin, HQ; Derrick Dunlap, SPN; Jay Aya-ay, Demi Syriopoulou, HQ; Dave Hale, University of Alabama; Joan Pope, ERDC; Luc Chouinard, McGill University, Montreal; Bill Chapman, LDOR; Todd Jennings, LRH; John McCormick, SAW; Mark Gravens, ERDC-CHL; Rodney Cremeans, LRH; Stuart Foltz, ERDC-CERL; Chris Dunn, HEC
Facilitator: Bill Curtis, ERDC-CHL
Recorder: Dinah McComas, ERDC-CHL
Reporter: Chris Dunn, HEC

Current Status of FCSDR Risk & Reliability Assessment

USACE has multiple tools to assess/measure risk and reliability of its flood damage reduction projects. Tools vary per project type and vary in strategy, rigor, usefulness, and rate of adoption by districts. Having multiple measurement systems appears to lead to inconsistent ranking systems which makes it difficult to prioritize, rank, and appropriately fund maintenance and remediation on a portfolio-wide basis. As with condition assessment, there are lots of pieces to this puzzle, but there is no overarching tool on which to base meaningful portfolio-wide decisions. Some of the tools used are FDA, (dambreak), HMS, and RAS have no consequences analyses. FIA is another tool that does analyze consequences.

Key concerns

Workshop participants identified many concerns relating to risk and reliability, which are listed in table 1 at the end of this section. The participants then narrowed the list to five key concerns using the "dot" voting method, with each participant allowed four votes. The key concerns, in priority order, were:

(**1) Damage element data quality.** E.g. floodplain mapping, the population at risk within that floodplain, the list of at-risk structures and the values assumed for each structure, etc. This is the variable with the most uncertainty in our risk & reliability equations. The areas being served by some of our F&CSDR structures have never been surveyed for the damage element. Others have surveys that are 50 or more years old. This seriously impairs our ability to direct funding to where it would buy down the most risk / provide the greatest benefit. Damage elements require periodic or frequent updating. Existing tools to improve identification and quantification of existing damage elements include an event damage software using GIS to compute inventory/ damage relationships (FIA), digital terrain models, HAZUS, LifeSim, and spatial data analysis tools (i.e., GIS, LIDAR toolbox). It is recognized that the Corps must define data quality objectives and implement data quality standards. Opportunities for collaboration include taking advantage of existing data across various levels of government including municipalities, counties, states, and federal organizations like FEMA, USGS, the Census bureau, and DOE.

(2) Predisposition for economics to dominate the evaluation of consequences and impacts over life and environmental risks. We have an ethical and professional responsibility to ensure the protection of life, property and the environment. In addition, all our activities we must abide by the Corps' Environmental Operating Principles. Current efforts to alleviate this predisposition include the EMRRP (environmental benefits analysis), application of LifeSim and HEP, and implementation of collaborative planning guidelines (EC 1105-2-409). Risk assessment methods related to environmental restoration projects must be developed. Continued collaboration with NGOs, resource agencies, other federal agencies (USBR) and other governments (ANCOLD) supports development of benefits that do not fall within the NED account.

(3) Determination and use of uncertainty. Each piece of data fed into our risk and reliability formula will have some degree of uncertainty associated with it. Ignoring this uncertainty can lead to undue faith in the results of the risk calculations, increasing the risk to life, property, and the environment. Understanding the uncertainty helps put risk calculations in context for decision makers, and understanding the different contributors to uncertainty helps to target research and study dollars devoted to improving the risk calculation models.

(4) Need funds and time to collect data. Risk assessment requires new and additional data to support the more rigorous computational effort. The more sophisticated or comprehensive analysis methodology demands data sufficiency (including rigorous QA/QC to minimize data set uncertainty). Much of this data will have to be updated periodically, requiring continual funding to produce the desired results. Tools and initiatives currently available or under development that support this priority include FIA, GIS, remote sensing (local and regional), MapMod, SPRA (to prioritize data needs), and the National Coastal Mapping Program. There is a need to define data quality objectives, improve hindcasting methods, and improve field observation/measurement programs. Required data may reside within a variety of organizations discussed previously, as well as other custodians of data such as NOAA, NWS, security agencies, academia, and USBR.

(5) How will risk analysis be used by decision makers (USACE) We need to understand the purposes for conducting risk assessments so the proper tools and data requirements are identified and implemented. Risk assessments can be costly and decision makers need to ensure that risk-based methods add value to the decision process making before mandating that practitioners implement the methodology. Existing tools, such as FDA and Beach-fx, can be applied through case studies to help formulate operational guidelines for making decisions based on the application of risk assessment methodologies. To better educate the decision maker and the practitioner, the Business Line should host risk and reliability workshops and classes. However there is a need to educate management and decision makers to raise awareness of how to interpret risk assessment output. We can look at how DOE and USBR have successfully managed education and outreach programs.

Order Listed	Concern	Votes Received
1 and 2	Determination and use of uncertainty	7
3	predisposition for economics over life risk and environmental risk	7
4	weakest part in modeling is damage function – how reliable is it	2
5	need funds & time to collect data	6
6	existing data is of questionable quality with regards to the damage element (environment, buildings, structures)	8
7	uncertainty with regard to elements of the protective system	1
8	lack of historical performance data	5
9	definition of limit states	0
10	poorly defined performance criteria for shore protection projects	0
11	failure mechanism uncertainty	0
12	lack of geotechnical data limits for uncertainty analysis for FDR/levees	0
13	failure versus damage progression	0
14	what constitutes catastrophic failure – (structural integrity(stability) vs functional performance)	3
15	How will risk analysis be used by decision makers (USACE)	6
16	how will risk analysis outcomes be applied to non-federal elements of a system	2
17	lack of public protection guidelines	3

Table 1 - Concerns identified in this breakout session

USACE Asset Management Risk and Reliability Workshop
15-18 August, 2006

Flood Control & Storm Damage Reduction (FCSDR) Business Line
How to Proceed

Participants: Stuart Foltz, ERDC-CERL; Dave Hale, University of Alabama; Luc Chouinard, McGill University, Montreal; Bill Chapman, LDOR; Rodney Cremeans, LRH; Todd Jennings, LRH; Chris Dunn, HEC; Derrick Dunlap, SPN; Demi Syriopoulou, HQ
Facilitator: Bill Curtis, ERDC-CHL
Recorder: Dinah McComas, ERDC-CHL
Reporter: Todd Jennings, LRH

Introduction

The final FDR breakout session was devoted to finding the highest-priority issue related to project condition and project risk and reliability that could be addressed, in part, at the field or practitioner level. The ground rules for this exercise included two governing assumptions: 1) that resolution of the issue was not constrained by budget, and 2) that policy and procedural guidelines existed for the Corps to incorporate condition assessment results into the asset management decision making process.
This second assumption became a stumbling block. Some in the group disagreed with the concept of developing condition assessment tools without first developing the framework in which those assessments would be used. A suggestion was made to overcome this obstacle, namely that the value of any Corps asset could be quantified across different outputs, or benefit streams (life/safety, economic, environmental, cultural, national security, etc.), and that the project's condition should be assessed in terms of these different benefit streams. This would bring all of the business lines and districts into a common frame of reference for portfolio-wide asset management decisions. It would also avoid the pitfalls associated with trying to merge all of the different benefit streams into a single indicator (e.g. putting a dollar value on human life or on the environment).

Problem statement

Even with perfect knowledge of the condition of every asset in the entire portfolio, there is currently no framework for using that information to make asset management decisions across business lines and districts.

Goal

Relate project condition assessments to all of the different outputs (or benefit streams) generated by that project. In other words, relate project (or component) condition to existing and future project functional value. Quantify the effects that different condition improvements

(maintenance packages, major rehab, etc.) have on each of the benefit streams to aid in prioritizing the needs of the entire portfolio.

Action 1
Raise condition assessment issue/goal/action items with FCSDR R&D Program Steering Committee at August 30-31, 2006 meeting (Bill Chapman, CELRD).

Action 2
Identify how the project contributes to its various benefit streams. That is, what types of benefits does each project provide, and how does it provide those benefits?
An understanding of project output value may be achieved through involvement of the field inspector/engineer with the project delivery team

- Timeline: As funding permits
- Benefits / consequences: Will help to identify which systems / components are critical
- Obstacles: The Corps has yet to define quantifiable metrics associated with all project outputs (Economic, Other Social Effects, Environment, Life Safety, etc) so that total project output value may be determined.

Action 3
Develop a list of critical or priority project components (those that contribute directly to output value). This action may be accomplished by the field inspector/engineer who understands how project components relate to output value.

- Timeline: As funding permits
- Benefits / consequences: Will help to develop model of project condition versus benefit streams. Will also help to target the frequency and thoroughness of condition assessments to match the value (in benefit streams) of the item being inspected. Could save inspection time and money by eliminating inspections of low-value components if such inspections are not cost-effective.

Action 4
Develop methods to correlate condition index/assessment outcomes with project risk and reliability. Action may be taken by ERDC and Centers of Expertise in coordination and collaboration with the field to develop methods. Principals of the development effort should collaborate with industry (e.g., HydroQuebec) to investigate existing methods that relate project condition to output value, and the applicability of these methods to Corps projects.

- Timeline: As funding permits
- Benefits / consequences: Will serve as a guide for developing condition assessment tools. Along with condition assessments and damage element tools, will link inputs (the funding of competing needs) to outputs (benefit streams).

Action 5
Develop objective condition assessment tools that support the correlation methods listed in the previous action item. Action may be taken by engaging ERDC, Centers of Expertise and sub-CoP PDTs (e.g., Rubble Mound Structure Condition Indexing PDT)

- Timeline: As funding permits
- Benefits / consequences: Along with the correlation listed above and the damage element tools, will link inputs (the funding of competing needs) to outputs (benefit streams).

Action 6

Engage in and collaborate with project stakeholders and other data custodians to update the damage element and population at risk inventories. Action to collaborate may be taken at a variety of levels within the Corps from District to HQ. Collaboration may be facilitated via formal MOUs/MOAs for data collection and exchange.

- Timeline: As funding permits
- Benefits / consequences: An updated damage element inventory is essential to determining project output value, and to sound asset management. However, updating the inventory is costly in terms of personnel and budget. If any of this data already exists, or would be useful to other entities, then collaborating would be more cost effective.
- Obstacles: No one currently coordinating this effort nationwide.

Action 7

Identify and apply existing tools to define and quantify damage elements in a consistent manner. This action may be accomplished by a coordinated communications effort amongst practitioners. Likely organizations to orchestrate the effort include an appropriate Community of Practice or Center of Expertise. Tool development may be accomplished by ERDC, Centers of Expertise, or industry partners in coordination and collaboration with the field.

- Timeline: As funding permits
- Benefits / consequences: A uniformly-applied method for determining damage elements affected by different projects will improve the quality of asset management decisions.

USACE Asset Management Risk and Reliability Workshop
15-18 August 2006

Deep Draft Navigation Condition Assessment (CA) Breakout Session

Participants

Michael Briggs –ERDC-CHL- facilitator
James Clausner – ERDC – recorder
Jeff Melby - ERDC
Bill O Donahue – Detroit District
Dennis McKinley – Nav PM in SAC
Ginny Pankow – NDC at IWR
Tom Verna - HQ
Bob Leitch - Portland District Waterways ma
Dan Beasley – Jacksonville, Operations,
Barbara Reilly -POA
Ron Brock (SWG)
Ken Claseman (SAM)

Summary

Coastal structure inspections and condition assessments are inconsistent and not uniformly applied. Districts with sufficient funds may inspect all their structures (only POD is known to do this), but most Districts only inspect a portion of their structures due to limited funds. No Districts completely use the existing Condition Index (CI) systems as defined and there is no standardized methodology or database for storing CI information for structures.

In the dredging area, hydrographic condition surveys, as required by regulation once a year, are the only type of CA that is conducted. Unfortunately, this is not done for all channels. As is typical Corps-wide, these surveys are prioritized based on usage and local knowledge. Existing hydrographic survey standards (of various types) are generally considered adequate. However, there is no consistent Corps-wide standard for storing/accessing hydrographic survey data.

Finally, disposal sites are a concern because in many locations, deepening of an existing project or a new project can not proceed if there is not sufficient storage space available; and distant offshore or upland disposal can make the project prohibitively expensive.

Top 5 Issues

The brainstorming activity resulted in a list of 15 items which were combined and prioritized to the top five issues or problems relating to CA in deep draft navigation.

a. Funding

We did not spend much time on this topic since it is pretty self explanatory. Funding

(impediment), there are lots of unfunded mandates from HQ; HQ must provide adequate funding.

b. HQ Leadership and Direction

HQ sets standards on Corps initiatives, conducts follow-up, and provides funding (ASA establishes through OMB). If HQ does not do this, then our work is meaningless. We might need to update existing guidance documents, including EMs, ERs, and tech transfer through workshops.

c. Required Depths and Minimizing O&M of Navigation Channels.

The process for getting deeper depths authorized in existing channels is very slow. Channel reliability is very important to insure functional reliability of channel. If customers have to light load because channel depth is not sufficient, they may abandon Ports and never return with the resulting loss of commerce. Are we meeting customers needs, are we maintaining required depths?

d. Data Needs

We don't have standardized data, criteria, or tools. We need consistency in how data are presented both within the District and to our customers. Record keeping and databases are inconsistent, making searching and analysis difficult. We also need standard, consistent, uniform functional criteria for coastal structures. Although we have a condition index tool for Coastal Structures, it is REMR 1980's vintage (it is not mandated for District use, however). We need a centralized (at least standardized) team for conducting inspections for consistency.

The second aspect of data needs is the "How" criteria or metrics to accomplish the condition assessment and R&R. ERDC's coastal structures group has developed some R&R standards for analyzing rubble mound coastal structure stability and degradation over time.

e. Communication and Stakeholders

Communications among HQ, ERDC, the outside research community, district sponsors, local sponsors, stakeholders, pilots, and other users is very important. We need to do this on a regular basis. Typical items to discuss include surveys, project status, and structure and channel conditions. Many Districts have procedures for this already.

Data Assembly

a. Tools

- Hydro-surveys of navigation are adequate and meet user needs. Manuals are adequate in most cases.

b. Gaps

- Metadata for hydrographic surveys is not standardized, although we have some standards, they are not enforced.
- We need a functional condition assessment tool for coastal structures.
- We lack a standardized GIS database for coastal structures, although this is a problem that is being addressed in on-going research. We have some tools for inspections, but

need to update these to take advantage of digital data from research work units and other ongoing work.

Needed R&D

We need to define the criteria for R&R.

Collaboration

The group did not get to this topic.

Notes from the flip charts from which the above were derived

Policy – Issue - Impediment

a. Coastal Structures inspections and condition assessments are inconsistent and not uniformly applied. Districts with sufficient funds, inspect all structures (only POD does this). Most Districts are funding limited and therefore only inspect a portion of their structures. No Districts completely use the existing CI systems as defined. No standardized database for storing CI information for structures.

b. For dredging, the Condition Assessments are hydrographic condition surveys performed as required by regulation by once a year. However, this is not done in for all channels, but surveys are prioritized based on usage and local knowledge. This is typical corps wide. Existing hydrographic survey standards (of various types) are generally considered adequate. There is no consistent Corps wide standard for storing/accessing hydrographic survey data.

c. Disposal sites. This was an issue because in many locations, the primary concern in the dredging process is where to place material or the cost of placing material.

2. Key Concerns/Issues (Raw list, not prioritized).
    a. Lack of HQ commitment and direction for CI, lack of funding, and lack of follow up, i.e., insuring Districts follow the guidance and policy.
    b. Corps provides rules and guidance (up to date), consistent policy to District execute, no follow up.
    c. Need to identify data
        i. Some members felt we spend too much time debating on how to massage data, when the real issue is identifying what data to collect.
    d. Criteria, indicators and metrics
    e. Ranking, tradeoffs, structure vs. channel, how to compare
        i. GIWW – apples/oranges, where do you spend your funds, tradeoffs between channels and structures, i.e., what is most important to fix. If you are having a problem in your channel (sedimentation), is it because of a problem with your structures.

    f. Functional performance
        i. Are the structures performing as designed, we should wrap functional performance into the condition index, a functional condition index, i.e., the final number should provide some indication of structure's ability to function as designed.
    g. Tiered approach, simplify
        i. Need standardized, simplified functional index for coastal structures, a tiered approach is recommended.
        ii. Shallow draft, the system is dynamic, natural

h. Standardized data requirements,
    i. This will allow that comparisons on a national basis and comparison across business lines (if practical).
i. Consistent Means for Computing Consequences
    i. Standard methods for computing consequences of not dredging/maintaining structures, **this will help in making consistent decisions nationwide for which project to fund.**
j. Include stakeholders
    i. Integrate users and stakeholders
    ii. Know using traffic (shipper that are using our ports).
k. Communicate risk and value to users and stakeholder and public
l. Navigation depths of our channels, Districts want to provide what the users need.
m. Want to minimize O&M costs (dredging and structures)
    i. Bottom line is the Reliability (predictability) for receiving funding to providing depths users need. Structures help maintain channel. If structures are not reducing dredging costs, they are not needed to maintain channel. Periodic inspection of structures is very straightforward in some Districts, because their deterioration rate is low.
n. Channel depths inadequate to meet traffic demands, we need a consistent process for delivering increased depths.
o. Centralized condition assessment team for coastal structures (help remove coastal structures).

Top five priorities (whys). We consolidated and combined according to what appeared to be similar ideas and issues.
Common Element in all is funding.

2. Funding
    a. These are pretty self explanatory, so we did not spend much time on it.
3. HQ Leadership (direction) – They set standards, follow-up, and funding (ASA establishes through OMB).
    a. If HQ does not do this, or will to do this, then all the other work is meaningless.
    b. (Tool/guidance) Have existing guidance documents, might need to be updated.
        i. These can include EM, ERs workshops.
    c. Funding (impediment) – lots of unfunded mandates, HQ must provide adequate funding.
4. Provide required depths, minimize O&M, process delivery for getting deeper depths authorized (process is very slow).
    a. Tools, GIS is both an existing tool and a need for future improvement.
    b. Channel reliability, may have to light load, may have to change Port if required depths not available (part of the functional part). Are we meeting customers needs, are we maintaining required depths.
    c. Tools – are adequate (survey tools are OK, need increased frequency).
        i. Metadata is not standardized – have standard, but not enforced.
        ii. Record keeping/database is inconsistent, making searching and analysis difficult.

iii. Research Needs.

d. Stakeholders are satisfied with the information.

5. What kind of Criteria, we need standard, consistent, uniform functional criteria for coastal structures.
    a. Have a condition index tool for Coastal Structures, REMR 1980's vintage (not mandated for use, however).
    b. Research needed in on-going. Lack of a standardized GIS database for coastal structures is a problem that is being addressed in on-going research. Have some tools for inspections, but need to update these to need to take advantage of digital data from research work units and other ongoing work (part of research WU).
        i. Need to consider begin dialogue on centralized team for conducting inspections, may not be centralized, but need to consider a trained team to provide consistency..
    c. Need a functional condition assessment tool.
        i. Don't have standardized data, criteria, or tool.
    d. Need consistency in how data are presented both within the District and to customers.
    e. Hydro-surveys are adequate and meet user needs. Manuals are adequate in most cases.
    f. The "How" criteria or metrics are being developed through R&D work unit on structures, have some standards.
        i. Delay in getting standardized channel dimensions and locations to NOAA????
6. Communication and Stakeholders
    a. Provide local sponsor survey, regular discussions.
    b. Communicate status of structure condition to sponsors and users.
    c. No standards from HQ on structures
    d. We have standards for communicating channel conditions to pilots and HQ.

What is smart to centralize and what is smart to standardize?????

USACE Asset Management Risk and Reliability Workshop
15-18 August 2006

Deep Draft Navigation Risk and Reliability Tools (R&R) Breakout Session

Participants

Michael Briggs –ERDC-- facilitator
James Clausner – ERDC – recorder
Jeff Melby - ERDC
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Dennis McKinley – Nav PM in SAC
Ginny Pankow – NDC at IWR
Tom Verna - HQ
Bob Leitch - Portland District Waterways manager
Dan Beasley – Jacksonville, Operations,
Barbara Reilly -POA
Ron Brock (SWG)
Ken Claseman (SAM)

Summary

We have lots of R&R tools, but they are not integrated and do not fit within an overall Asset Management (AM) framework. We want to take advantage of tools in other business lines to incorporate the best parts of their efforts so as not to "reinvent the wheel." Basic data is lacking in many cases. In summary, we need to keep deep draft navigation channels open and safe, optimize our limited funding, maintain safe useable harbors, serve our customers and stakeholders, and keep U.S. healthy and competitive in the global economy.

Top 5 Issues

The brainstorming activity resulted in a list of 15 items which were combined and prioritized to the top five issues or problems relating to R&R in deep draft navigation.

e. HQ Guidance

This first issue was similar to that from the first day for the CA breakout session. We need to know the requirements from HQ and how AM decisions will be made. Who will use the information we collect and how will they use it. The Districts and other users will need training on use of the new AM tools.

f. Asset Management

The second issue dealt mainly with AM. How do we rank and compare projects, especially among different business lines. How do we include consequences of actions or inactions? We need to consider regional economic development (RED) versus national economic development (NED). How is channel design included in the process?

g. Data Needs

The third issue for R&R dealt with obtaining the data we will need to do the risk and reliability efficiently and accurately. Some missing or incomplete items include structure failure functions for coastal structures, channel width and depth requirements and associated ship motions for new, larger vessels.

h. Standard Design Guidance

Design guidance must be upgraded to address new vessel fleets, channel depth and width, changes in functionality should be included in design analysis for channels and structures, and our ability to predict shoaling rates as this affects entrance channels and dredging.

i. Environmental Consequences

The final priority issue was disposal area availability to insure continued maintenance and new work dredging. Channel depth and width improvements can be shut down if you do not have an environmentally acceptable location to put dredge material from the channels.

Data Assembly

a. Tools

We have lots of R&R tools for deep draft navigation, but none are consistently used on a nationwide basis by all Districts. For entrance channels, the CADET program can predict underkeel clearance for a range of ship types and loadings, channel configurations and depths, and wave conditions. Economic consequences are not directly included in CADET, but are being developed by the IWR/NETS program based on CADET output. IWR under the NETS program has developed the HARBORSYM program for risk-based harbor design and throughput analysis. The ERDC's Ship-Tow-Simulator can perform simulations for pilot training and channel width and alignment design, including some depth predictions. Although physical models are not generally risk-based, a procedure has been developed to obtain risk-based results from them.

For major rehabs of coastal structures, the Corps requires a risk analysis to maximize NED benefits. The latest guidance on risk analysis, ER1105-2-101, is located under planning on the Corps EM site (and attached). The CHL has developed Empirical Simulation Technique (EST) and Empirical Life Cycle Simulation (ELS) tools for prediction of coastal structure reliability.

b. Gaps

We need consistent, good quality data for channels, ship response, and coastal structure design. We need to know the economic consequences (i.e., social, environmental, and local and regional) for harbor closures. We need to know what the target probabilities for design will be and how the OMB Risk guidelines will be applied to Corps Projects.

Needed R&D

Although we have started to develop some new programs for risk-based design, none of them is

a sufficiently mature technology that we have developed user's manuals. We need to define the criteria and methodology for R&R for use in the channel and coastal structure arenas. In the future, we need to describe details and step by step instructions on the procedures for applying these programs. Of course, continued adequate funding is fundamental to insure we can move forward and incorporate R&R in deep draft navigation.

Collaboration

There are many different organizations that pose opportunities for collaboration. Some of them include ERDC's Coastal and Hydraulics Laboratory and Environmental Laboratory, Institute for Water Resources, the Deep Draft Planning Center of Expertise, MDC, USACE District Offices, harbor pilots, ports, PIANC, ASCE, National Waterway Conference, Resource Agencies such as EPA, USFWS, and NMFS.

Raw Notes from the flip charts from which the above were derived

Deep Draft Navigation R&R Tools Basic Statement

We have lot of R&R tools, but not integrated and do fit within an overall AM framework. Basic data is lacking in many cases.

Top Five concerns

Who will use information and how will they use it. Need requirements from HQ on how AM decisions will be made

Need training for Districts on use of the new AM tools.

Asset management, how to rank/compare projects, consequences, RED vs. NED, channel design

Data Needs, structure failure functions, channel width and depths requirements for new, larger vessels, ship motions.

Standard design guidance must be upgraded to address new vessel fleet, channel depth and width, Changes in functionality (channels and structures and incorporate in design analysis), ability to predict shoaling rates.

Disposal area availability for continued maintenance and new work dredging. Can't dredge if don't have a place to put it. (Has environmental consequences)

Overall why these are important. Keep channels and open and safe for navigation, optimize funding, maintain useable harbors (safe), serve our stakeholders and keep US economy healthy and competitive globally.

Tools
Zero tools for Risk and Reliability that are used consistently on a nation-wide basis

Economic consequences tool for loss of channel depth (is under development in NETS)
Structures
CEM
CEDAS
ELS, EST
@risk
Channels
Cadet – vertical
STS – width and vertical
Phys Models
Numerical models, ST, CGWAVE,
Harbor Sym
CHARTS/LIDAR

Gaps
Basic consistent (good quality) data
Methodology
Economic Consequences (both from a social, environmental, local and regional economics of harbor closure)
Target Probabilities for design
How the OMB Risk guidelines will be applied to Corps Projects
Continued adequate funding for navigation data collection (waterborne commerce data) – foundation for the consequences.

Collaborators
ERDC,
IWR
Deep Draft PCX.
MDC
Pilots
Lots of Districts, both on structures and channels
Ports
PIANC
ASCE
National Waterway Conference
Resource Agencies – EPA, USFWS, NMFS

Inland tools that relate to locks could apply to the few deep draft locks and deep draft projects

Impediments
Funding, timely HQ guidance, training of Corps staff

USACE Asset Management Risk and Reliability Workshop
15-18 August 2006

Deep Draft Navigation - How to Proceed

Summary

The objective of this breakout session was to prioritize our goals from the previous two days, develop the main goal for deep draft navigation, and define some actions that should be done to achieve the objectives of R&R within the Corps.

Goals

The deep draft navigation Business Line has two general focus areas – channels and coastal structures. Although we have some tools for engineering design, and some even include risk-based design components, we do not have a coherent methodology or structure for putting everything together to accomplish the Risk and Reliability aspects of a project. There is a lack of centralized databases – how we should tie reliability to consequences (especially economic consequences), and how we define Risk and Reliability for different levels (tiers). Some Business Lines are more mature in their development and application of Risk and Reliability and we feel we can benefit from their head start. Thus, we need to develop a consistent, universal, and tiered framework for asset management (AM) of deep draft navigation channels and structures. This framework needs to be consistent with and supported by "corporate" AM policy.

Actions

We recommend that the deep draft navigation Business Line conduct two "Pilot Studies" to develop the methodology and framework for channels and coastal structure design. The first pilot study would be for a deep draft channel (jettied inlet) with primarily dredging issues. The second pilot study would deal with the design of a breakwater for protecting a coastal harbor and mainly deal with wave issues. The purpose of these pilot studies is to work out the "bugs" and develop a consistent set of steps related to Risk and Reliability for channels and coastal structures. We do not necessarily have to "reinvent the wheel" as we can use existing studies that had some of the pieces of Risk and Reliability already accomplished. Some suggestions for channel-based projects include Oakland, MCR, Barbers Point, and LALB. Poplar Island (dredge disposal area with revetment), Neah Bay (breakwater design), and Buffalo District might be good candidates for a coastal structure project. Some of these projects have both aspects of deep draft navigation, so might be good candidates if we were limited by funding and time constraints to just one pilot study. We would develop a "strawman" or draft manual of the procedures that should be followed in a Risk and Reliability study. Once this document is reviewed and revised, we would need to get the technology to the field using tech transfer mechanisms such as workshops, short courses, etc.

Follow-up

Mr. James Clausner volunteered to initiate the action identified above and report back to Dr.

Knight by 31 October 2006. Mr. Bob Leitch requested he be included as the pilot project is developed.

August 18, 2006 Breakout Session – Raw Notes

Attendees:
Mike Briggs (facilitator- ERDC), Jeff Melby (ERDC), Jim Clausner (ERDC), Ron Brock (SWG), Ken Claseman (SAM), Barbara Reilly(POA), Dennis McKinley (SAC), Bob Leitch (NWP), Bill O'Donahue (LRE), Ginny Pankow (IWR), Todd Bridges (ERDC)

1. Major goal is to quantity consequences (economics). Loss of depth due to sedimentation (either by "normal shoaling" or loss of structure length) causes an obvious economic impact. Also, loss of structure function, increases waves, reduces ship traffic, also has an economic consequences.
2. We need to consider the threat of the environmental issues to deepening projects. E.g, resuspension issues can halt a deepening project (as evidenced in New York Harbor). These issues need to be considered during planning, not during execution.
3. IWR has done some work on the availability of channel depth.
4. The Navigation Data Center is working on Navigation Project profile, depth, length and miles of channel, this will be included in a Central Database (this has been a problem).
    a. An issue has been how to handle channel surveys.
5. Question for the planners, where is the engineering and economic analysis put together. This needs to be done
    a. Answer, Corps of Engineers doesn't like to talk reliability and risk. Need a middle ground from a planning study, like the Dam PRA, several levels, risk notion and consequence notion. Carry that framework to an individual project evaluation, question of level of detail to organize things. Corporate AM notion is the portfolio.
6. Noted they did not consider expert choice, not totally satisfactory
    a. Need some science behind some of it.
7. Define uses of Risk and Reliability at different levels of use, PM, District, Division, HQ, DM – define AM
8. Mention of a harbor project at Neah Bay- getting sufficient protection, consequences on one side, and engineering on the other side. Economists need a wave height table/function that defines the point at which the harbor cannot be used.
9. Comment on the Coastal Structures Asset Management Decision Tool being developed under the Coastal Inlets Research Program (CIRP), goal is to identify the 100 most critical projects and build an asset management decision framework utilizing economic impacts as defined above.
10. We need an overall the framework for managing deep draft assets that can be used to do a pilot study. (do one for dredging and one for structures).
    a. Jetties inlet deep draft navigation project
    b. Harbor project.
11. **Selected GOAL – Framework for Deep Draft (coastal) Asset Management (Consistent with Corporate AM Policy)**
    a. Must realize the framework will be tiered, including R&R, for different levels of uses.

12. **Selection Action – two pilot studies, one a deep draft channel (Jettied Inlet), primarily dredging issues. Second study, a breakwater protecting a coastal harbor (mostly a waves issues). Case study must be useful for the field.**
    a. Must be Consistent with other BL (will be lessons learned from other BL)
    b. Have to realize not all the information will be there, 50% solution.
    c. Get methodology to the field, tech transfer important. Should be O&M if possible (could be major rehab).
    d. Pilot study with phases, end up with draft manual. Must be implementable in the field in a short period of time.
    e. Possible projects with some information already available, - Oakland, MCR, LA/LB.
13. Question on Frequency of R&R type studies for a project
    a. Ideally once a year for developing budget priorities. How often do the Districts use it. Once a year. Must have information to update annually easily, pretty much just push a button. Suggest every five years do a major update. Use CI/CA to define the asset. If have a major storm, or project change, then update.
    b. Individual BL will tell HQ what the guidance. Data collection/quality an issue. If Districts will be using the data to help justify budgets, more likely to get good data.
14. Sandra Knight question, what is the next step, Nav BL mgr identify resources
    a. Response
        i. Try not to require too much new information – use existing data where possible
    b. Leveraging as much as possible on existing District projects
    c. Run by Nav BL mgr, Deep Draft center of expertise (Ken Claseman), IWR, include Steve Hughes – CIRP work unit- Structures Asset Management Decision Tool
        i. Include Dave Shepp in the process
        ii. Report by 31 October, use research dollars (Nav Systems) as seed funds
        iii. Identify Districts.
    d. Goal made tool useful for project management and help with budget prioritization.
    e. Buffalo has a tool to evaluate navigation consequences, part of FYDP.
    f. Disseminate results by 1st or second week of November to entire group.
15. Include Bob Leitch as part of team (his request

USACE Asset Management Risk and Reliability Workshop
15-18 August, 2006

Inland Navigation – Condition Assessment Breakout Session

Attendees:

Michael Winkler, ERDC-CHL, Facilitator
Peggy Van Norman, ERDC-CHL, Recorder
Stephen Stoltz, LRP
Rick Theobald, LRB
Guillermo A. Riveros, ERDC-ITL
Anjana Chudgar, HQ
Mike Kidby, HQ
Bruce Baker, ERDC-ITL
Rich Lockwood, LRP
Tim Smith, LRH
Mark Hammond, LRH
Col. Alan Estes, United States Military Academy at West Point

The goal of the workgroup representing the Inland Navigation Business Line was to develop a framework for action on how the Corps can more effectively implement Asset Management (AM) for the entire portfolio of Corps assets within the Navigation Business Line.

The Corps currently has an array of tools that can be applied to performing Condition Assessments within the inland side of the Navigation Business Line. The Corps also has tools under development that can be applied to Condition Assessments. However, there is nothing specific to performing assessments in the Inland Navigation Business Line that will help with management decisions. No standard or integrated package currently exists that can be used to perform Condition Assessments within the Navigation Area. A standard would help with the integration of the existing tools. Also, there is a lack of understanding of what information is needed and how that information will be used at a higher level.

Tools that are currently in the Corps portfolio for performing Condition Assessments:

Structural Condition Assessment tools
Engineering reliability analysis
Hydrographic Surveys
Non destructive testing (NDT)
Periodic inspections of structures

All the concerns of the inland side of the Navigation Business Line regarding Condition Assessments, and associated 'votes':

How to use existing data best = 1
CI Criteria = 0
Standardize Inspections = 4 (Combined with a later theme)
CI Relation to risk = 0
What is the remaining useful life = 0
Limit state guidelines = 4
ID critical data needs = 2
Centralized database for condition index data across business line = 7
Standardized Language = 6
Intent of AM = 9
Performance measures for projects = 0
Metrics without politics = 0
Is there systems approach = 7
Bayesian technique = 0
Separate Risk Analysis from Risk Management

The top 5 concerns of the Inland Navigation Business Line as determined from above voting –

1. **Intent of Asset Management.**
2. **Is there a systems approach?**
3. **Data base for condition data.**
4. **Standardize language and inspections.**
5. **Limit state guidelines.**

1. Intent of Asset Management

A clear definition of Asset Management is needed and how it applies to the Inland Navigation Business Line. This definition will provide traction to implement and guide the asset management initiative. A clear definition will further explain how funding will be prioritized and will ultimately yield better business decisions. All projects could be ranked using a common procedure thus providing a clear way to identify "winners" and "losers."

A uniform way to rank projects should be used not just within the inland side of the Navigation Business Line but across all business lines. In the end, having a clear definition of Asset Management will allow the Corps to develop the right system the first time around.

2. Is there a systems approach?

A broader use of the systems approach would allow the Corps to utilize resource needs across business lines.

3. Data base for condition data.

A common centralized database helps ensure projects are assessed and discussed consistently. The data should be collected locally, housed in a central location, and used nationally. The common database also provides a way to share engineering data to help with future predictions and estimations of similar projects.

4. Standardize language and inspections.

Standardized language and inspections will help avoid confusion and help ensure projects are assessed and discussed consistently. It will also help facilitate sharing practices across business lines.

5. Limit state guidelines

There should be a clear definition of the tolerable level of performance for projects. Currently the Corps has no standard definition of 'tolerable level of performance.'

Gaps

Currently the gaps for the inland side of the Navigation Business Line are the lack of standards and criteria. There are also gaps in how data is collected and used to evaluate projects.

Summary

The Corps has tools that can be applied to the Inland Navigation Asset Management and other tools are under development. No standard or integrated package currently exists. How these tools will relate at a higher level is not understood.

USACE Asset Management Risk and Reliability Workshop
15-18 August 2006

Inland Navigation – Risk and Reliability Breakout Session

Attendees:

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Tim Smith, LRH
Mark Hammond, LRH

The group's key concerns and associated 'votes' regarding Risk and Reliability tools that exist within the Inland Navigation Business Line follow:

Hydro and Dam Safety are way ahead of Navigation..... 0
ORNIM is a good start. It needs to be modified to fit other needs 0
Q Pack and Nav Pack are add-ons but more needs to be done. 0
Future plans are to run Q Pack and Nav Pack along with ORNIM 0
Not much for tools outside LRD 0
Need inputs from other river systems 0
More modification 0
Process, procedures, and policy not defined..... 9
Been fortunate that SPRA is looking at Dam Safety (excluded from ORNIM).....10
No centralized data base 9
No standardized language 0
Limit state 0
Lack of tools to measure R&R.....10
Training and Qualification..... 7
Identify and define 0

The top 4 concerns are the following

1. **Lack of Tools to use to calculate R&R within Asset Management.**
2. **Define Policy, Process, and Procedures to define limit state and standardize language to systematically calculate R&R.**
3. **No Centralized database.**
4. **Training and Qualification**s.

1. Lack of tools to measure Risk and Reliability

Uniform tool to standardize the calculation of R&R is needed to objectively prioritize funding corporately

Need to define a starting point and then to perform standardized procedures. A uniform tool will help standardize language. This needs to be at the district level and HQ needs to understand the language. This would also help ensure that all projects would be assessed and discussed consistently.

2. Define policy, process, and procedures to define limit state and standardize language to systematically calculate R&R.

This is needed to defend, prioritize and rationalize programs necessary to develop appropriate R&R data and tools

Need for policy, process, and procedures to define limit state and standardize language to systematically calculate R&R.
Need to define, prioritize, and rationalize programs
Need to develop appropriate data and tools

3. No Centralized database.

To provide a uniform foundation to communicate and measure performance and future developments

Need a standardized database that is centrally located for R&R data across business lines. The data needs to be identified and housed in a uniform structure in a centralized database. The Dam Safety Program should be investigated closer to create a process similar to theirs. The tools will help the Corps prepare for the future so we can look back and measure performance. The use of the tools or the way projects are rated should be done in a uniform way. One of the most necessary future requirements will be the development of metrics. Those metrics will provide a uniform foundation to communicate and measure performance.

4. Training and Qualifications.

To ensure that everyone has a uniform corporate vision and direction and to develop and sustain a consistent R&R capability into the future

Once standards and criteria are in place, training will be vital to ensure consistency and to keep ratings equal. Training will help add value to the data that is collected. Training will help ensure the Corps fully develops sustainable Risk and Reliability program.

Summary

Need to define USACE policy, procedures, and processes, and to develop tools (data) to establish effective and accurate R&R implementation to ensure future sustainability of Inland Navigation Assets

Gaps

- Lack of standards and Criteria
- Gaps in data collection/usage

USACE Asset Management Risk and Reliability Workshop
15-18 August 2006

Inland Navigation – How to Proceed

Goal: Conduct National portfolio assessment of inland navigation infrastructure to ensure present and future sustainability of mission. (By developing policy, process, and procedure and implement)

A corporate team needs to be formed using the Planning CX as the coordinator for the Inland Navigation Business Line. This team should include stakeholders, engineers, environmental, operations, Regional Navigation Design Team (RNDT), Headquarters, R&D, IWR, ERDC.

Define the Requirement to perform assessments and the purpose of an assessment

a. An assessment allows for a project to be evaluated over the project's life by comparing the present to the past.
b. With assessment data a project can be compared to other projects within the system, allowing for a corporate comparison and contrast.
c. A definition is needed of the Data Requirements/sources/collection/IT System for a corporate perspective.
d. Tools will be identified in an iterative step as the data requirements evolve. Tools, data, and purpose will change as time and requirements change. This process can not be handled with the issuance of an EM or ER; it must evolve.
e. Educate – Train – Communicate the framework to the stakeholders/managers/operators.
f. DO it

Additional issues that should be considered in defining the requirement to perform an assessment and the purpose of an assessment:

a. It will be necessary to engage the RNDT to act as a conduit for engineering and operations.
b. A system for monitoring the components of inland navigation structures will have to be developed.
c. As the various systems and tools are created it will be necessary to define a standard scale that is applicable across business lines for assessing condition.
d. The policy on how condition assessments are to be performed will have to be established.
e. Frequency of inspections will have to be defined in the criteria or policy.
f. For this to be sustainable, it will require the training and education of the owners/operators.
g. The IT/IM tools, databases, and capabilities to store the information will be defined.

Action Item 1 is to develop corporate team –

Using Planning CX
Business line managers must be engaged and buy into process (who will lead)

Must be national and multi disciplinary and across functional areas
Engage stakeholders such as CMTS, IWUB…
Within Corps across DIV/DISTRICTS/ERDC/IWR/HQ
Operators' input is as important as stakeholders', as everyone's.

What action needs to be taken to get this going?

Mike Kidby and Sandra will meet with BL manager maybe next week. Hopefully they will get instruction to go forward. Mark and Tim are to get message to Tab Brown, .

Random thoughts

Is channel dredging part of portfolio?
FEM should be integral to data system and assessment
This goal really doesn't resolve budget connection
This goal should provide baseline assessment
This goal should fit into larger framework

USACE Asset Management Risk and Reliability Workshop
15-18 August 2006

HydroPower – Condition Assessment Breakout Session

Fundamental Assumption

A fundamental assumption for the Hydropower Business Line is that Condition Assessment should consider all assets which allow generation of power in an effective and efficient manner, including direct hydropower equipment and related assets such as fish passage equipment and other joint assets.

Condition Assessment Tools

Condition assessment tools include, but are not limited to, the following:

a. HydroAMP
b. Engineer Regulations
c. HT&E Program
d. Experts and knowledgeable people
e. Monitoring systems
f. SCADA
g. Data bases
h State water quality standards
i. National standards
j. International standards (industry standards)
k. Physical tests and specialized diagnostic equipment for performing evaluations of the equipment

Current Assessment

Better communication integration is needed, across both hydropower and related business lines at multipurpose projects. A wide range of methods presently exist to conduct tests. Some tests are conducted by in-house expertise, and some tests are conducted by contractors. Data bases should be available to all interested parties. Application of FEMS/MAXIMO will improve this issue. Funding, staffing, and training are common concerns to assure condition assessment intent. Not enough resources presently exist to accomplish thorough condition assessment. Much of the condition assessment work would otherwise be done in-house with the District's own crews. Most facilities which may be nearing breakdown only receive maintenance attention, and a thorough condition assessment is usually not performed.

Generally, it is known how to conduct a thorough Condition Assessment, and the tools are essentially available for performing such a thorough assessment; however, resources for accomplishing this task don't always exist. Good tools exist, but not enough people and funds to do the condition assessment are always available. Current tools available are for the most part

already validated and proven.

Concern exists that we are losing our in-house expertise. The Corps relies heavily on HDC for testing of equipment, as staff engineers in field are doing more program management than technical work. It is a resources issue. Generally, we have enough assessment tools and have adapted new technology as it came along. HydroAMP incorporates the standards that now exists for the major components of the powertrain and significant support equipment, but HydroAMP needs to be enhanced and upgraded continuously as new knowledge becomes available. Guidance from HQ to confirm that HydroAMP is the fully supported standard for Condition Assessment is required, and should include adequate funding for all 75 plants.

Key Concerns

The HydroPower Condition Assessment breakout team considered 5 specific concerns:

- Supplemental resources are needed to implement Asset Management. (7 votes)

- How Condition Assessment results will be used by HQ, Divisions, Districts, and Local managers should be ascertained. (1 vote)

- A common language is needed, with interpretation (translation) across Business Lines for consistency. Each Business Line may develop it's own condition rating criteria, and work with others. An asset should be defined as a powerhouse, but do Condition Assessment should be conducted on smaller units (parts), to arrive at the overall assessment of the whole system. (3 votes)

- Careful thought should go into Condition Assessment and Asset Management with a HydroPower Business Line focus supported by the Real Estate Business Line (instead of vice versa). Alignment of assets should be performed so the AIS systems will be compatible with definitions for consistency, and to assure that costs and activities are fully transparent at lowest burden. (5 votes)

- Quality, availability, and repeatability of data are significant concerns. (4 votes)

Additionally, there needs to be full consideration for integration of ecological sustainability in Risk and Reliability context for meeting environmental responsibilities, but this is a Risk and Reliability issue as opposed to Condition Assessment for Asset Management: thus, this is not actually a key concern for Condition Assessment.

Top Three Concerns

The HydroPower Condition Assessment breakout team believed the top three concerns to be:

- **No. 1 Concern: Resources.** Adequate resources show corporate support and intent to get results. Lack of resources indicates lack of linkage between value of the product and the money available to do that assessment, and not assuring the assets are maintained at an acceptable

reliability level based upon asset Condition Assessment. Appropriation funding instead of direct funding from PMA such as Bonneville Power Association is a political issue that continues to assure a disconnect between the value of power generated and the essential resources needed to fund Asset Management at level of Risk and Reliability needed by the eholders/rate payers.

● **No. 2 Concern: Definition of Assets.** There is a distinct need to precisely define exactly what constitutes a Corps asset. This is necessary to allow alignment between inventory, management of the asset, and the capturing of the products benefiting by that asset. There also exists a need to define a reasonable level of detail to allow the different tools to augment each other in minimizing costs and efficiency in determining the Condition Assessment of the equipment and/or asset.

● **No. 3 Concern: Quality of Data.** Good quality and availability of the appropriate data are essential for performing a Condition Assessment for obtaining a valid result. There is a pressing need for the right data of the highest quality obtainable.

USACE Asset Management Risk and Reliability Workshop
15-18 August 2006

HydroPower – Risk and Reliability Breakout Session

Minimal Funding to Conduct Risk and Reliability Studies

Only three Corps Districts with 21 plants in the NWD are presently at a point where they can use Risk and Reliability in decision-making scenarios, because these are the only Districts where adequate resources exist. Lack of funding in the other Districts with 54 plants now precludes effectively using Risk and Reliability techniques in decision-making. Corps Districts are leveraging where possible Corps-wide without burdening ratepayers in the Pacific northwest. Here it is assumed that all equipment and plants with anything even remotely to do with power generation lies within the scope of interest.

Regulatory Standards and Compliance Issues

Regarding Risk and Reliability, there are either definitely known or assumed assets to deal with. Industry standards (KPIs) already exist. Many Environmental Impact Statements exists, and water quality standards and air quality standards have been developed. Governmental/NGO stakeholders provide feed-back on acceptable levels of reliability. The driving forces all have some definite laws or regulations they are following. Defining Risk and Reliability always requires reference to the regulatory document that carries enforcement weight (Endangered Species Act, etc.). All these compliance issues fall under the heading of regulatory and legal. Not everyone is a ratepayer, but all stakeholder have significant input to rate hearings. Compliance issues (environmental and safety issues, and National Energy Reliability Council interpretations) all must be factored into determining the Risk and Reliability levels acceptable that the asset conditions are evaluated against. Actual tools for conducting a Risk and Reliability analysis include FEM MAXIMO for failure analysis, work management, and data management.

Key Equipment Requires High Reliability

A key piece of equipment in a certain condition must have high reliability. Lesser important equipment may go out of service for maintenance periodically without greatly impacting other things. Generic data acquisition equipment can use monitors to see how closely a piece of equipment is approaching a jeopardy situation, so that constraints can be applied to that equipment. Assets regardless of condition may be overloaded at times, and risk of failure is increased. System restoration manuals provide methods to recover if the system approaches a hazardous point. A body of knowledge already exists on the consequences of failure, but must be judiciously applied to specific situations or series of situations. Columbia Vista and Water View are numerical simulation models that match up the fuel (water), and best method to allocate that water. It is desirable to market some of the power at the highest price available, and to provide efficient use of all the resources. All activities influence the operation of the equipment, and every action influences the Risk and Reliability. Each activity and action carries its own set of risks. A piece of equipment in one place operating under a given set of conditions

may have minimal risk to the system, but that same piece of equipment in another location operating under a different set of conditions could have a much higher risk.

Activities Must be Optimized Continuously

Power generation, flood control, fish migration, and environmental issues must be optimized on a daily basis, and each activity significantly affects the daily operation methods. Each activity has different levels of significance, and must be evaluated individually and in concert with other relevant activities. Asset Plan involves harvest, sustain, and enhance options for operating and maintaining the plant. Strategies and values are established to determine generation, maintenance, and recapitalization of the physical plant. Events change both daily and seasonally. Scheduled lockages for recreation craft are established so that the water can be used for fish passage and power generation. All these events enter into determining the comprehensive level of risk that can be tolerated. All these activities and repercussions thereof must be optimized on a daily basis. Near-real time optimization methods are just now being developed. For example, if the dispatcher requires certain specific functions, and the operator can determined which units must be used to provide the best plant configuration and operation for both the dispatcher requirements and for all other associated activities with value events.

A common currency must be established to determine the best combination for optimization among all the different values received. RAM D and CISP determine what our security posture should be. Dispatching of power is processed out of the marketing agency. Historical data about the water availability provides for the development of a marketing plan, so that scheduled unit down-time can be pre-established and programmed into the operational activities. Having a plant-availability too high may take resources away from where they could more effectively be used. It is necessary to balance all the plant facility missions with the agreements that have been reached by all concerned agencies through the years.

Needs

HLH, NRTO, and RAM-D are presently available operational tools. Columbia Vista, Water View, and Asset Plan simulation tools need to be enhanced. Three Strategic Items used as the basis for the Asset Plan include (a) low cost power, (b) reliable power, and (c) trusted stewardship. The Corps has already developed Asset Plan and two pilot plans, and is now completing 19 other plans for the Pacific Northwest. FEM should capture all labor, material, etc. that has been put into preventative maintenance and other work types. The fundamental foundation idea is to analyze the unit plan to determine its role in the system. There is a need to continue with development of the Risk and Reliability tools, as these tools are not nearly as advanced as the Condition Assessment tools. The Corps presently isn't really using the higher level tools. Asset Plans have three options for a plant: (a) harvest it, sustain it, or (c) enhance it. After determining the values that the plant could provide in each of those options across the full spectrum of purposes, assessing the acceptable Risk and Reliability for the assets, using Condition Assessment of the assets, and projecting the costs for each option, a preferred (optimized) asset management strategy evolves. This optimization occurs in the context of that plant's value to the system in the operating environment currently in place. Individual units within a plant are further evaluated for individual decisions for funding, Risk and Reliability

levels, etc.

Require a More Active Community of Practice (COP)

There exists a need to query other Federal and private interests to determine what risk tools they may be using. These risk tools should be evaluated for appropriateness to Corps applications. There is a definite need to determine efficient use of water resources, staff, funding, etc. The Corps must prioritize/optimize operation and maintenance to meet multiple purposes. These and other less prominent needs can be better addressed with a more active HydroPower Community of Practice.

Underlying Concerns

The Corps must have the ability to meet environmental compliance while meeting production requirements. Uncertainty exists about Risk and Reliability studies have already been performed. It is necessary to survey all agencies to determine what presently exists and where gaps in the data and technology may need to be filled. The Corps should determine these present Risk and Reliability studies both for guidance in future analyses and to prevent duplication of effort.

USACE Asset Management Risk and Reliability Workshop
15-18 August 2006

HydroPower – How to Proceed

Recommended actions to improve Asset Management in the context of Condition Assessment and Risk and Reliability:

- **Condition Assessment**

    - Improve and standardize work management for operation and maintenanceof hydropower assets by deploying and utilizing FEM
    - Gather data by the routine use of FEM for O&M of the assets, and use that data for Tier 1 HydroAMP assessments at all 75 plants
        - Determine assets requiring Tier 2 assessments
        - Accomplish Tier 2 assessments
    - Evaluate classes of assets within the portfolio for use in Risk and Reliability analysis
    - Determine resource requirements for the above activities, considering the benefits of direct funding of hydropower by the PMA and/or the preferred customers

- **Risk and Reliability**

    - Collect and evaluate the effectiveness of existing Risk and Reliability tools or studies that may be applicable to hydropower assets and their operation, and consider industry sources and the reliability analysis that NWW did for emergency closure gate issue
    - Determine gaps in needed Risk and Reliability tools
    - Apply FEM for operation and maintenance work management, and gather failure data on assets/major components to level justified by asset class
    - Perform reliability-centered maintenance evaluations on key components using existing industry tools that are readily available
    - Using OMBIL and NRTO, capture and adapt operational performance to determine gap between asset performance and system requirements in conjunction with PMA, where performance also includes all environmental compliance and stewardship aspects.
    - Assist in the further development and application of Columbia Vista and Water View
    - Use class of assets and tools gathered or developed to determine Risk and Reliability assessments

- **Asset Plan**

The Corps should develop and document a long-term action plan for each asset (facility), and one for the power system in it's entirety where those facilities reside, that maximizes the value of asset output relative to objectives of low cost, reliable power, and trusted stewardship to the

service area of the system, region, and/or nation. The Corps should consider capital, routine operation and maintenance, and non-routine maintenance projections.

Benefits and Consequences of Implementing the Recommended Actions

- Reflects an understanding of responsibility and accountability inherent in the ownership of the assets
- Directly links value of the outputs of the assets and the burden of operation and maintenance, rebuild, and/or replacement
- Reinforces life cycle lowest cost at a justified level of reliability and risk tolerance
- Improves reliability by applying the available resources to the most effective and efficient actions
- Recognizes that all assets are not equal, and that they have to be managed in the context of the value returned for justified burden and evaluated risk

Obstacles and Roadblocks to Implementing the Recommended Actions

- Basic work management and standards across portfolio are not presently embraced
- Inconsistent, inadequate, or wrongly allocated resources at front line
- Culture that all assets are equal with little understanding of value of asset's products, the asset itself, and the defined burden per unit of value
- Inconsistent leadership and guidance across entire portfolio
- Stakeholder/ratepayer requirements little understood, with difficulty in comprehending conflicting views and needs.

Opportunity to Further the Asset Management Effort

Annually the HydroPower Community of Practice convenes a strategy development meeting with attendees representing each District and Division with hydropower facilities, including the Power Marketing Agencies (PMAs) and other invitees such as Bureau of Reclamation and Tennessee Valley Authority (TVA). The next meeting is tentatively scheduled for late Oct 2006. During this meeting, three specific topics will be requested to be addressed:

- **Asset Planning and Management**, using Condition Assessment, and Risk and Reliability assessment and management efforts
- **Use of FEM** for the Asset Management efforts
- **Benchmarking status** for all Corps hydropower using Electric Utility Cost Group (EUCG)

Since most efforts to date in this context have been within the Federal Columbia River Power System (FCRPS) with its 21 plants in NWD (NWP, NWS, NWW), a review of their activities will be followed by planning efforts to broaden the success in NWD and it's partners (BPA and USBR).

FEM deployment planning and furthering of its utilization for Asset Management is ongoing. Rock Island and Little Rock Districts have pilot deployments for their respective Regional Business Centers presently underway. NWD is striving for full utilization capability by end of

FY06 in FCRPS.

HydroAMP has previously been used in FCRPS, and updates using better data gained from FEM utilization are ongoing. Lessons learned here will also be valuable to using HydroAMP portfolio wide.

EUCG benchmarking data submittal has already occurred for the Corps' 21 FCRPS plants using FY05 data. A results workshop for all EUCG participants will be held in mid-Sept 06. HAC has been tasked with developing a process to benchmark all Corps plants to include costs incurred by the PMAs with a goal of having all plants in the process by FY08. Planning for that effort is expected to occur at this meeting as well.

USACE Asset Management Risk and Reliability Workshop
15-18 August, 2006

Flip Chart Notes from all Plenary Sessions

R&R Workshop Issues /Discussion

1. What are selling points of Asset management to Business arrears?
   - Generate report from existing data to perform job better
   - Build culture of doing right than over long term.
2. Who are 1 or 2 World class leaders in Asset Management?
   - No one is doing it well
   - Nuclear power plants – pretty well
3. What handful of tools do you recommend?
   - What data collection
   - What is good enough?
   - See slide – each area needs attention
4. it's not the model it's the data
   - Consistency accuracy, precision not up to par
   - Look at surrogates for data into models.
5. Uncertainties w/long term predictions
   - Technology charges
   - Setting closer to right
6. What do we own?
7. What is remaining useful life?
8. What does nation need in terms of next 100 yrs?
   - Not going to rep
9. Lessons for Aerospace?
   - Preventive maintenance
   - Damage due to maintenance
   - Unpredictable traffic levels – other resources
   - Shuttle work
10. Condition doesn't necessarily specify when failure will occur
    - Provides clues if quantified carefully
    - Tells general state of function
    - Ranking based on level of deterioration

Plenary I Discussion CI

11. Real property/others doing inspections in future should there be a policy change so types of data collected charges/improves?
    - Daily basis work orders
    - Have inspections done – tail rather than complete w\each other.
    - Data is not going forward
    - Data not simple snapshot.

12 Huge numbers of inspections that are field and not used. FCAT in LRD need CI. Need simple when have 100 of Assets within budget constraints. Get in right Ball Park.

13. Criteria & weighting selected are critical.
    - Ex.: pipeline – missed something

Start but good thinking
Have to revise as we go.

14. What level of Requirements by ONB Bulletin Project, Agency?
    All the above
    Distinction between Risk analysis and risk influential
15. CI is better for looking at small details rather than larger systems. R&R handles larger system or more complexity of detail? R&R tailor CI.
    R&R w/higher ranking.
16. Is main issue uncertainty? What level of uncertainty drives the R&R ANALYSIS?
    Policy makers weighing
    Have tiered approach to address
    Prioritization
17. Different kinds of Risk?
    Safety
    Mission failure
    Structural
    Many different metrics
    Metrics may vary be decision makers
18. RI can account for failure Where CI cannot
    Take into account time factor assessments made for a discrete time period.
    Trend now is to consider annual Risk.
    Longer time period higher chance of extreme events
19. Once structures in place how do we reduce uncertainness
    Different approaches for new and existing structures
20. Structures in operation for 40 or 50 years have low reliability. How to measure R&R.
    If no sign of deterioration
    Reinforced concrete bridges documentation lost if in place w/no sign of deterioration consider acceptable
21. If built for known parameters like vehicle weight – does this decrease reliability
    Answer is very political – how to estimate/account for growth
    Decision no change to be included to avoid immediate cost to industry.
22. When talking disposition, took from1988 - 2004 for Fox River.
    Disposition is an Issue of funds & communication.
    Get list out that needs disposal
        Start policy changes in motion
        Motivate
23. Fix, Dispose, change evolution in function all options. How does change fit in?
    This needs more attention, policy examination.

Discussion

24. Definition of an Asset is it tied to performance?
    Eg. Miter gate doesn't do any good without system
25. Asset classification within each section.
    Further define in priority of Risk
    If fails what is impact on whole system Major Failures bigger Risks.
26. WE can't call River an asset but we spend a lot of money dredging

De-allocation as assets to other parties would not be practical
Ports and Harbors. Conceded OMB- may make adverse decisions.

27. Does definition of Asset need to be tied to funding.
    Definitions still being developed.
28. Criteria: Economic Benefit to the nation.
29. Attempting to define all Aspects of system in NW Fed (Col River, Power system Corps w/ B of Rec.)
30. Decision
    Within BL's be inclusive of "Assets"
    Define/id criteria that BL defines as Asset
    Last day see if any statements from group to move forward.

I. Navigation

1. Develop criteria needed to meet Navigation needs for budget preparation.
2. Think Integrated w/other BL corporate view. Multipurpose view.
3. Looking for knowledge for prioritization
   Criteria basic.

II. Flood & Cosatal

1. WE need to come up w/system to prioritize budget. Across business lines.
2. Account ion for true costs of projects.
3. Existing system must incorporate
   Risk & Reliability Concepts in budget process
   Dam Safety (most important)
   Levees
   Breakwater
4. How to incorporate Watershed.
5. Shore protection
   Breakwater Repair
   What should be in Flood D.R.?
6. Published guidelines to fit FDR But not others
   Breakwater (good Example) don't know how to handle.
7. Is Administration Anti-Beach
   Nourishment Remove from ACE

III. Hydropower

1. Reliable Power at lowest possible cost
2. Asset Definition an issue granularity w/in plant
3. How are we performing w/respect to Risk & Reliability?
   Unit Availability
   Mitigate Risk
   Improve reliability
4. Hydro Amp – Lesson Learned
   Condition Indicator
   Parts of country
5. What decision process to prevent failure of components.
6. How to compare performance to similar suppliers

7. Decision process for how to prioritize budget.

IV. Recreation

1. Field based system based on performance aspects and conditions of facilities at projects. Relative benefits of improvements.
   Base budget on improvements/Performance NED.
2. Field manages need to understand how their data feeds decision.
3. Align information system so can get new information out.
4. Managers have Access
5. Predict Future policies incorporate
6. Changes in demographics impacts
7. Better handle on cost Information Based on Eng. Practice of 20-30- years ago. Most cost efficient incorporated into planning
8. be more nimble – react quickly to changing condition transformation investment
9. Prevent unintended dis-incentives for manager to participate in reaching goal.

V. Centralization vs Decentralization

1. Have Apples and Apples for making decisions
   Need central data base for each BL E. Species Dam Failure
   Decision making at Lower Level Respect their bottom up priorities.
   Mitigate perception of completion between programs.
   Consistent policy
   Respect Field View Let guide program.
2. No standardized Inspections need to help address issues
   FDR = Resides in Emergency Management for Inspection
   Implementation may be breakdown.
   May not exist for other structures.
   Come up w/standard language (workshop)
3. People at Corps lost way because decentralized
   Distinguish Operation/Execution from leadership/Execution from leadership/Decision making will be a rating shift will see winners and losers
4. Question for needs consistency across BL Metrics that include loss of life are different
   We offer technical information other institutions help drive decision
   BL can share common performance metrics - should do
5. Still making decisions across BL so more transparent “Better”
6. NW trying to come up w/common currency Power, Nav Values (fish Passage)
7. Benchmarking for Hydropower may have in Recreation – How to do in something unique to us in Locks?
   Average damage prevented
   Benefits provided
8. Navigation difficult BL to come up w/performance measure
   How to demonstrate valve of projects.
9. Are there lessons to be learned from European System?
   There is value in exchange
   It’s an unresolved issue for them as well.
10. Ton Miles defined on River that isn’t an Asset
    They consider it none –the-less

11. Team to look age performance indicators on Inland Waterway International – call for Interest.
12. Need performance Metrics that help politics fall of the table?
13. Transportation Research board
    Cost vs. benefits
        Productivity exceeds damage w/increased truck weight
        How to get benefits feed back into repairing system
        Apply concept to /navigation system
        Benefits spread out
14. Minimum acceptable Service level Benchmark for each individual Asset/Facility – How are we doing?
    Issue of performance levels 2
        Small # of performance measures for budget decisions
        Large set of measures status of Corps managers to Act connect manager to performance measures
15. Benchmark against Competitors Hwy – Rail, -- Global
    If OMB wants CI across all Agencies
    Congress is handler of money include Balance of trade – see how computation does.
        If it didn't move by water assume move by Rail – No longer true don't have capacity. Must look Inter modal
        Metrics – cost unit, effects on environment.
        Reliability depends on weakest link. Pulling down
16. Carry Paradigm over to FDR
    Yes can transfer what happened after Katrina – Don't happen again.
17. Recreation? Co
    Benchmark against service
    Levels of satisfaction – other Co
18. for deploying across corps come up w/program management
    Need practices in each BL
    If have condition Assessment process
        What information do you need to support R&R Analysis Specific to the BL?
19. How would you Risk Assessment of watershed process that aren't in our Asset system
    Don't have a good answer
        Privately built Levee system
    Have to include how to build into system
    Hydropower – Non Federal units could drain reservoir – MOA for maintenance Levels we take over in emergency.

1. Where is old REEMR system?
    a. hydroAMP is updated assessment
    b. what lessons learned from old system
    c. how to move forward

2. One criteria for tools to use is put into GIS format? Possible for hydroAMP or should merge with Corpsmap
    a. able to use links now
    b. there is a bolt to Maxima

3. Does it work w/RQ shapefiles – which is Corps standards for GIS?
    a. Its doable w/time, money, understanding of level of integration needs
    b. OPIE – Louisville has some capability
    c. Data mining of personal experience into GIS
    d. Benefit w/FEM for integration at minimal additional cost
    e. P2 continues to link w/CEFMS at high level operation, detail in FEM many work orders in FEM to 1 funding level of P2
4. Already deployed?
    a. We are implemented in 5 districts
    b. Deployed in Rock Island, soon in Little Rock

5. what changes based current deployment in Louisville
    a. web based Maxima & FEM
    b. business line have to know how you want to manage your business – wat3ershed , etc – to apply FEM to do work right

6. How do we use the data we have?
    a. Can't do as well as would like because of limits of data

7. industry went to more streamlined approach, How would we be more streamlined w/REMIS
    a. simplify existing conditions of miter gates reduces 50-65%
    b. Look at multi-level inspection process – quick & dirty then more detailed.
        i. How to improve efficiency = issue w/existing tools and methodology

8. Uncertainty wasn't communicated in examples – how do you account for uncertainty in process
    a. Dam safety uncertainty – economics, loading
    b. Is threshold on failure on line because of uncertainty
    c. If have a lot of knowledge and still high risk = action
    d. Track uncertainty of what know and see how affects risk
    e. How is accounting for uncertainty carried through? – show standard deviation will influence (?)
        i. How to quantify uncertainty? How is uncertainty integrated into the in decision making = issue

9. directorate of expertise is where
    a. LRD – Lyn Richardson
    b. HQ – px

10. when talk about probability of failure when have less than failure…minimum:
    a. What could cause lock chamber to close for significant time:
    b. Limit stages set for analysis
    c. Expert solicitation
    d. 3-4 potential levels of failure = days out of service presented to decision makers/users

        Limit state determination guidelines

11. how do you perceive environmental reliability in this analysis
    a. hasn't been explicitly addressed yet
    b. not putting dollar values on environment
    c. observe/adapt
        i. assessment of environment risk methodology

12. limit state function of acceptable /unacceptable has to be set before analysis
    a. examples don't want it to open to often, cracks – couldn't agree – then reached consensus on 2 wks, ex – deflection come out of probability analysis
    b. limit states haven't been defined past examples
    c. very specific needs to be identified individually

13. What is acceptable loss?
    a. There is no decision rule
        i. Determination or tolerable risk

14. always have to accept some risk
    a. acceptable ==tolerable

15. last bullet is why should separate assessment and management otherwise accused of 'fixing' answers
        i. risk assessment versus risk management and associated guidance

16. Need guidance from decision makers on scope of risk assessment.
    a. Always have team approach for novice risk assessors
    b. Have problem/question in pocket – easy to get off track

17. Have the original hydroAMP group be keeper of process for other areas – keep true to process.
    a. Value of collaboration and coming to consensus on important values and how to evaluate them
        i. Key to successful implementation is collaboration and consensus

18. Has risk and reliability been used as a standardization of design (in turbines, etc). If use in all projects then are developing more data through standardization...

a. hard to standardize the equipment because particular to hydraulics
b. can't specify on design but on performance
c. use for where to spend money

19. should we be using standard equipment t so can replace more easily – less down time
    a. have done spares
    b. beyond scope of asset management
    c. consider the baseline assessment
    d. aggressive approach in NW for circuit breakers for BPA/sign off on O&M & maintenance plan in place to break cycle of not worrying about maintenance until a break occurs

20. To what extent can we use CI to measure the relative risk?

21. If we are going to use CI, can you use multiple levels to optimize benefits?

22. how do you intend to use that metric – what is the question you really want to answer with the business line – on risk & reliability – what are you trying to get at…

23. What is a condition index?

24. What are criteria that define a condition index in each business line?

    a. Criteria = condition indicator for equipment

25. Are we homing to physical asset or capability to provide service or functionality? what is a tolerable level of performance – say how to determine tolerable

26. How do we deal w/different funding streams in asset management process?

ISSUES

What are criteria that define a condition index in each business line?

How do you intend to use the metric – what is the question you really want to answer within business line, on risk & reliability..what are you trying to get at

To what extent can we use CI to measure the relative risk?

Should we be using standard equipment so can replace more easily – less dead time.

Have the original hydroAMP group be keeper of process for other areas – keep true to the process – key to successful implementation is collaboration and consensus.

Separate risk assessment and risk management to avoid perception of 'fixing' – risk assessment versus risk management and associated guidance

What is acceptable loss – determination of tolerable risk.

Need an assessment of environmental risk methodology

Need limit state determination guidelines

How to quantify uncertainty – how is uncertainty integrated into decision making

How do we best use the data we have?

Industry went to more streamlined approach..how would we be more streamlined with REMIS -- how to improve efficiency with existing tools and methodology

Data mining of personal experience into GIS

For each business line -- have to know how you want to manage your business – watershed, etc – in order to apply FEM to do the work right

Develop criteria needed to meet navigation needs for budget preparation

Looking for knowledge for prioritization criteria basis

We need to come up with a system to prioritize budgets across business lines

Accounting for true costs of project

Existing system must incorporate risk and reliability concepts in the budget process

How to incorporate watershed approach

What should be in flood d.r.

Administration anti-beach nourishment – remove from ACE

If come up w/metric for storm damage reduction – cut off?

Asset definition an issue – granularity w/in plant

How are we performing w/respect to risk & reliability

hydroAMP – lessons learned, CI to other parts of country

what decision process to prevent failure of components (hydropower)?

Decision process for how to prioritize budget

Field managers need to understand how their data feeds decision process

Align information systems so can get NEW information out

Managers have access to info systems

Use info to predict future – policies incorporated

Impacts of changes in demographics

Be more nimble – react quickly to changing conditions, transform investment

Prevent unintended dis-incentives for managers to participate in reaching goals

Centralization vs decentralization

Question for needs consistency across BL – metrics that include loss of life are different

Need central data base for each business and have criteria consistent across BL

Decision making at 'lower level' - respect their bottom up priorities

Mitigate perception of competition between programs

Consistent policy – respect the field's view, let guide program

No standardized inspections – need to help address issues

Come up with standard language and workshop

Benchmarking for hydropower may have in recreation – ho to do in something unique to us, i.e., locks

Navigation difficult BL to come up w/performance measures – how to demonstrate value of projects

Ton miles defined on river that is not an asset

Need metrics to help politics fall off table

Minimum acceptable service level – benchmark for each individual asset/facility – how are we doing?

Benchmark against competitors – highway, rail, global

Carry paradigm over to fdr

Recreation – benchmark against service

For deploying across Corps, come up w/program management – need practices in each BL

How would you handle risk assessment of watershed process that aren't in our asset system?

What handful of tools do you recommend

It's not the models it's the data

Uncertainties w/long term predictions

What do we own

What is remaining useful life

Lessons from Aerospace

Condition doesn't necessarily specify when failure will occur

Real property/others doing inspection – in future should there be a policy change so types of data collected changes/improves

Huge number\r of inspections that are filed and not used

CI is better for looking at small details rather than larger systems? R&R handles larger systems or more complexity of detail.

Is main issue uncertainty? What level of uncertainty drives the R&R analysis

Different kinds of risk

RI can account for failure where CI cannot

Once structures in place how do we reduce uncertainty?

Structures in operation for 40-50 years have low reliability – how to measure risk

Disposition is an issue of funds and communication

Fix, dispose, change –evolution in function – all options –how does change fit in

Definition of an asset – is it tied to performance

Asset classification within section – if fails what is impact on the whole system – major failures =bigger risks

We can't call a channel an asset but we spend lots of money on dredging

De-allocation as assets to other parties would not be practical – e.g., ports and harbors…concerned OMB may make adverse decisions

Does definition of asset need to be tied to funding

Criteria: economic benefit to the nation

16aug06

http://chl.erdc.usace.army.mil/rriam/presentations site for presentations

Plenary 2

p1 Halpin
1 to what degree are environmental risks incorporated into planning process
They aren't
2 ESA and issues can prevent delayed maintenance of levees.
But in emergency can make change
We need to maintain levees
3 baseline risks – the risk we will assume?
No, not 'tolerable" – just what it is
4 when you say the consequence data is poor – what data elements would you look for?

P2
5 does slide –risk - represent global (structural) stability of navigation dams or the successful operations(economic risks: navigation)
Risks bought down cheaply are mechanical things fixed – low hanging fruit

Rich (bill harder)
6 when said 33% were below operating expectations what meant
Below acceptable level of performance
7 can you show how under cost and benefits
Maintenance on Ohio system has demonstrable impact of main chamber closing, etc; part of process working on – 5 multipliers used for prioritizing in FY
8 like approach to knowing how doing – is there a common thread to problems?
Probably not – more site specific
P3
9 noticet that asset management aplans have a conceptual; basis simplicity is great; criteria can be debated
Smart things doing
Intermediate inspections
PRA
More examples
Economic data is woefully inadequate
Spoke of example of MR3 – there are uses that spring up that we aren't tracking
10 so looking at impacts went beyond our uses to others
Yest – that's entire economic impact
Some people don't want to share their usage data
But people beginning to realize importance of sharing
P4
11 can we domify individual acceptable levels of performance into something more uniform
Hope everyone did opemly & honestly

Looking at minimum; possibly like an A76 process/high performing organization process

Level of acceptability

Get team to go from facility to facility

12 what about end users minimum level of acceptability

Will look at use aand how it changes, won't operate in closed environment

13 is this a useful tool fro prioritizing maintenance?

No we prioritize maintenance in 3 yr budget cycle

P5

Rux

14 what criteria used to determine data quality indicator

Was current, accurate, etc – there is guidance

15 tier 2 tasks have some that were routine in the past is recommendation to not do these annually?

Specific plan is built to be flexible for individual sites

Not meant to stifle innovation; there are specialized tests that are being developed, can be added to tier 2

Defines minimum

P6

16 plants could do more testing individually

Not using for 'leveling issues'

17 used in all of NWD?

Done where BPA involved, working to get to all of NWD

Big question is how will Corps use CA information

18 will data all feed into same database

Yes, and includes BOR data

Now only includes tier 1 data

May change

19 want to use FEM that supports this CA process

P7

20 is there a plan to put data quality indicator into a probability format

No, use this indicator to inform level of testing

don't know confidence levels

No – it's subjective

20 Spending energy on driving process for data collection, consistency so the data is good instead of trying to get probability

Planning to get data quality indicator up

21 good-not good drives testing then the testing will give it good value

22 drives training specifications for evaluation

Lo CI [QI] = high probability of problem

23 is highest number 3 – did you work hard on getting weighting factors right

Maximum value is to be 10;

Different for different equipment

Lots of thought went into these – each technical team had to come up w/own scoring

P8
24 teams set criteria & values – separate team for ea component
Yes
25 were you concerned CI wouldn't roll up properly
Need technical teams to do re-evaluation check

Break

P9
Clausner for Jackson
26 targeting 75% service level
Cost to reach
How accomplish
For each budget increment
How do they accomplish levels of service
Service=visitation
27 throughout year information data is put into database and imported into RECBEST at end of year
They use OMBIL for database
P10
Chouinard
28 color code on slide 37
Red -importance of deficiency
Blue – condition
29 how did you determine CI for the broad spectrum of components?
Spillways – managed by hydropower plant engineer, mechanical, electrical dam safety engineer – gates, etc
Every year an engineer has to sign off on condition of day – they like objective process
30 Like the way you built in operational piece …how is it balanced with equipment?
Come from different pools of money
Operations very important and account for majority of events/near misses
Operations=gathering information –water level infiltration
P11
Checklist very helpful to avoid failures based on bad equipment
31 much redundancy built in
Driven by people generating dollars
Estes
32 where would you see monitoring fitting into this process
Depends on the monitoring – strain gauge would be great
Video, any type would improve the results
33 a lot risk rather than reliability based
Could have used example of earthen dams and used same system
P12
34 what decision made with this tool
Same type as made with any CI same type made without CI

Inspect class of structures in same way

Guide where to put scarce money

are we talking decision to fixing or to do more looking

This is good triage

Are treating all structures the same?

Could put importance associated with ea structure

Could also be used to communicate w/public and decision makers the condition of infrastructure

Marrano

35 distinction between CI and R&R is very important; predicated on design and conditions experienced; doesn't necessarily mean project will perform at high level – important to be careful what convey to public with reliability

Consequence awareness different

Calibration and scales different

36 can look at trends in CI over time == assumes conditions will remain the same

37 lesson learned from Katrina – continually revisit loadings and designs for structures after events; CI on original loadings fine; revise factor of safety as structure deteriorates or we have more knowledge

38 there are lot of similarities across business lines as well as differences

Can take different classes of structures and get values that can be compared

39 issue of how to integrate climate variability into CI tools.

Discussion – other key issues – Key Issues

1 consider beajin analysis for condition index assessment (allows you to narrow down for condition index assessment

2 in order to compare across BL, have a rating system that is consistent – this is a framework issue

3 define what is the intent of Asset management

4 should CI have suitability of service for different (future) needs

5 there is a difference between condition and functionality, and should they be integrated into one

P1

1 description of risk random variables in Monte Carlo analysis, how did you deal w/ Can correlate when…..

Assumption of no correlation gives lower risk analysis – any way of assessing implications

When have finite element analysis felt it was calibrated well – didn't worry beyond that about correlation

2 why using 10,000-50,000 instead of larger numbers

Weren't getting failures , saw differences taper off after 50,000

3 how long does usual run take?

In Visual Basic, 5-10 min – 50,000 iterations

In Excel, a few hours when tracking failures

4 how many limit states?

For gates 1 – cracks that would buckle

4-5 types of limit states for

19 –

2-3 for Ohio River

5 how did ranking compare with 5-yr plan presented yesterday?

Gave to Bill Harder – was coordinated went into his criteria

6 random variables like barge impact effect?

Weren't looking at extreme events, combine w/barge impact – looked at normal operation

Big effort to look at closure studies – how long, what cost

7 did you find OMNI data was accurate & reliable

No – cross referenced 4 set of data –CEFMS, lock books, etc

Operations was tied to repair record most reliable

Many people didn't enter all the data into OMNI – varied project to project

Resulted in good lock information by going to lock and go thru book

8 what is confidence level that all this effort will result in repair dollars

Out of our hands – competing w/other projects, but do have Markland $$ now

What is the acceptance rate of product

Just finished, when reviewed in HQ got O&M for Markland gates – not rehab because competes w/ new starts

P4

9 when started had forecast for lock expansion?

Had a reduced projection on

10 is this a 1 year time-step model. What problems do you have modeling stochastic processes that may have cumulative effects?

In 25 yrs of data – through into random and gave probabilistic level
Did test if higher forecast predicted more o&m
Assumed schedule of future rehabs and that is less realistic

P5

Halpin

11 usgs playing into levee assessment?
Lots of feds; an interagency group, non feds too

12 is COE gearing up fro data demands of PRA
Neither COE nor other agencies gearing up
Levee gaps – engineering assessments
0.5 billion dollars – scares OMB, congress – they want to see where we are going

P6

13 what are simplifying assumptions?
Cross-sections to look at for a dam
Properties for stability assumption
Representative lengths
Uncertainty bounds
Lots on consequences ~ warning time
Not site specific
Fatality rates don't assume same across structures

14 can't just rely on engineering assessments
Hydrologic: 1 in 10,000
Hurricanes : 1 in 2000
More frequent than structural engineering (can't rely on just structural engineering)

15 not going to get to theoretical correct solution – need to get what decision makers need, get a combination of what is theoretically correct with what is possible

16 who generates public protection guidelines – based on loss of life could be economics too
First door is like a safety door – life loss?
Others are 2nd & 3rd order …

P7

17 first test will be New Orleans
What will be public's appetite for life safety

18 New Orleans 1700 killed – thousands displaced
Some of economics is replacement of physical loss
Going to be toughest part

19 for not considering upstream failure – lose pool at 3 disables 4
Caveat: where we own – we manage; separating consequences of other owned upstream failure

Don't want to lose piece of we must integrate and coordinate our planning considering others.
Do we fix our dams to accommodate other dams' failure – no, just communicate to them their risk

20 seems we should account in risk accounting
No – we take care of ours – they own consequences of both

21 isn't it what the public assumes, as in New Orleans – we are responsible for levees
New Orleans is not a good example
We inform other owners of the risk
This is really a legal issue
22 if don't account then will underestimate risk – if have temporal correlation of factors and don't consider upstream
Are considering that as part of PRA
P9
23 is there a simple way to wrap up consequences from PRA to communicate to legislature the state of infrastructure – what needed, what will happen if we don't get
We are working on that
BoR gets politicians to buy-off on public predicting justification for action – emergency, study and remediate, tolerable risks
Corps doesn't have explicit risk yet so we use 'active failure'
P10
Gravens
24 can you apply this to a barrier beach configuration?
Yes, but can't apply to ends
Not entire island migration
300' inland; not cross island sediment transport
Not breaching

25 sea level make a difference -50 yr simulation
Sees it as secondary
Climate change may affect types of storm – intensity & frequency
Have a baseline, then double
Could include in storm suite some hypothetical storms, then have to get a probability for storms that haven't occurred
Puts responsibility on analyst – future will be like past, or else defend your take on the future
I treat this as a sensitivity issue – do as though future like past and then look

26 are you tying into other Corps processes – sediment retention in Corps structures so beaches not rebuilding
Not looking at where the sand is coming from

P11

27 how are planners handling uncertainty in alternatives analysis
We are looking at for first times
I'm not sure how they are looking at it – not that far in process
Have hi – med – low

28 is a question all projects have to look at ; who is going to make decision to buy down rather than just live with central values

29 does this apply to Corps mission for risk assessment i.e., delta size correlates to amount of damage
Katrina the wetlands not a solution – was too big a storm
Lesser storms – islands and wetlands are more important
Beach nourishment buys down 10-20 yr storm damages; 50 yr storm buy down we can't afford

Break

Melby
P1
1 do you look at the cost resulting from a breach, since the structures are there to protect some infrastructure
Include line item for breach failure costs
Didn't get that far
Harder problem to solve

2 confused about role of managing inventory
ERDC is building tools
Have periodic inspection research project only
District can 't afford to develop GIS so ERDC helps

3 develop R&D funds – have a portfolio assessment of coastal structures
P2
Briggs
4 if uncertainty is not incorporated in curve; there are studies that incorporate uncertainty of ships squat and other parameters so a place to start would be to include those; also, how to incorporate economics piece
Ian w/IWR looking for tool to incorporate economic into CADET. Not all combined yet. Will use that opportunity
Days/year accessibility is management tool
Imbedded uncertainty wasn't shown but it is there
Would be good to show the confidence bands

5 (not used)

P3
6 have you shown this to pilots who live with the risk

No – did on physical model study and they liked the tool

7 stakeholder input is important on the CADET model

8 deep draft owners call it negative keel clearance – how to maximize the benefit
Pilots know they can scour mud not coral
Will wait for high tide

P4

9 do you subtract out non-navigational days based on other events – weather, etc
Yes, it's in the calculation

10 are we going to deal with channel width
Not in CADET but at ship's simulator at WES

11 can you simulate approach to locks
Not with CADET
No – can simulate width of channel for calculating squat
You are talking aobut near field – we use physical models – don't have a simple model for design

Audience discussion

12 OMB risk assessment bulleting touches on everything discussed so far – make sure we are in compliance after goes into effect

13 does Jeff Melby's changes to 'pyramid' explain differences in CA & RR
Yes, but the tiny triangle at top is the most important and least defined
Looking for terminology explanations/terminology definitions to move up
Don't use pejoratives – pin the analysis to answering the questions – not everything has to have expensive R&R analysis

14 who has lead in OMB on the risk assessment
Unknown, also unknown when will be required on draft

15 IM-IT requirements --are they going to be separate or integrated portfolios is still missing – framework

16 spending 2.5 times resources on IT-IM business process –it is time consuming and costly –
IT-IM going to A76

17 difficult to come up w/return on investment for IM-IT **ISSUE**

18 does couching uncertainty give us a better idea of what we've got?
Different context of developing tools for decision makers

Understanding of uncertainty too difficult to communicate up
Need different tools for decision making, including Congress and OMB

19 decision makers have to be comfortable with the process so need consistent method of prioritization with technical justification then decision makers can work.

LUNCH

Breakouts

18aug06 morning

Def of Asset mgmt - discussion of the use of "performance" – how do you define performance, that performance is a reliability measure not value;

Define performance
Reliability #?

Maximize value of asset to the nation

Performance is reliability not value
Part of value to nation

Maximize life cycle performance
Economic value

--

However we define, include context

-- ---- -

Fdr question

Who should lead the team to focus on these action items? Maybe the fdr r&d, ask the steering committee; **do out** – bill chapman will ensure this gets brought to the steering committee meeting; has to be education/outreach at district level to help district folks id outputs – they need the big picture

Jerry barnes

Hydro questions
Time & cost and level of effort to do all of the action steps would be useful.
Are developing long range plan for implementing fem; will have to start with generic use of it – first two items in ca are already in or near action; ea district/div will have to do the last item under ca – led by bl leader (sadiki);;; risk and reliability tools – will be continued in NW, then migrate out…starting to engage stakeholders and other divisions with hydropower; will that group be able to clarify gaps, etc – prob need consultant help on that; need good transition between design center, hydr center & maint/engr capability (these will be the ones to do r&r); need to better engage cop across coe; guiding group is the strategy meeting in **do out** oct – Charlie to take this all to that group

Do the do out people to report back to Sandra? Sk – cc her but report directly to bl mgr

Deep draft

Do out – develop a pilot study and need some seed $$ from hq – bl mgrs, iwr, deep draft cx – Clausner by 30 oct;

Inland

do out Mike Kidby and Sandra will brief new acting bl mgr next week (who will not be around long, so has to be short fuse); Mark and Tim will deliver msg to Tad, and will coord w/mike and sandra within the month

people at mtg would like feedback on these action items – Sandra will pass on the cc's she gets to the groups.

Anything else:

Integration pieces – do outs?

FEM integrates across business lines but for facilities and equipment

Dictionary of definitions

Maxiize outputs for each value to nation category valid across bls

Share data requirements resources

Fund development across bls (fair share)

May NOT get common CI

Centers of Expertise must integrate across bls, not be 'stove-piped'; this should include all the 'centers' within the corps
Best use of centers
Introduce AM to CoPs

Communication system can solve many integration problems
(to include stakeholders)

ACTION – AM Gateway link to ea bl

ACTION – IT systems rules/guidelines – centralized; 1. one-time data entry has to be a rule

Must be corporate
Leverage internally & externally